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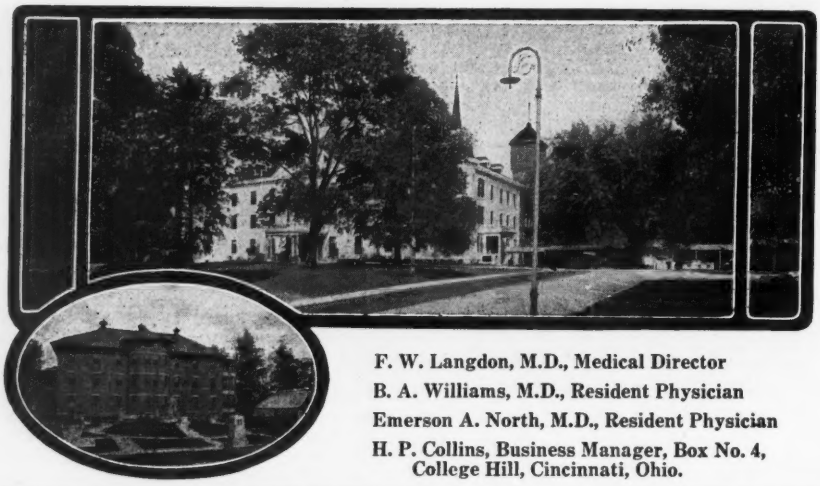

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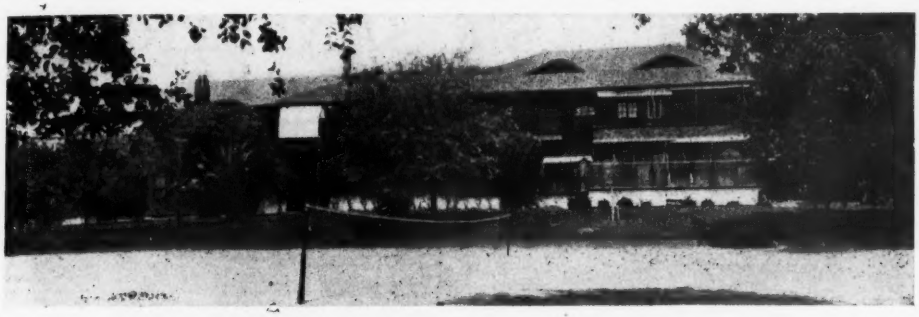

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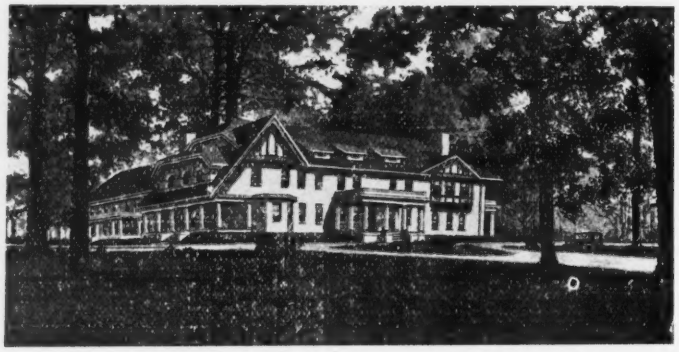

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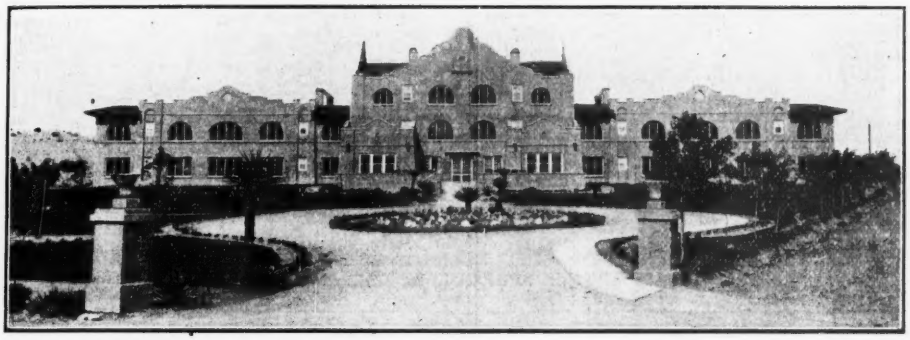

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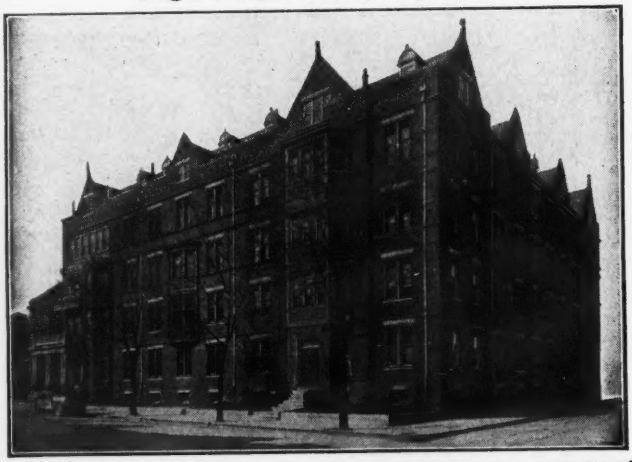

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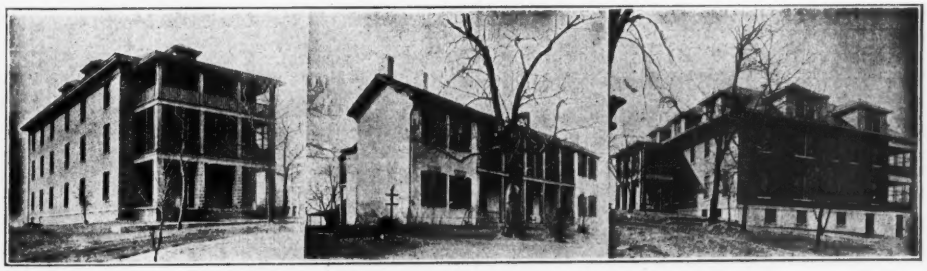

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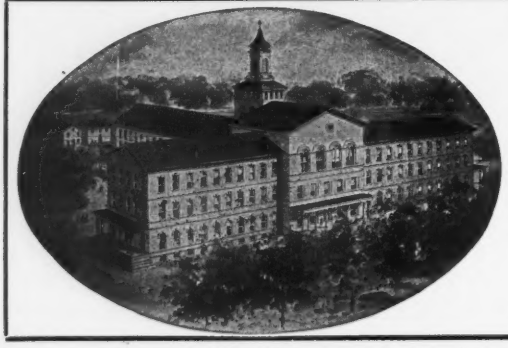

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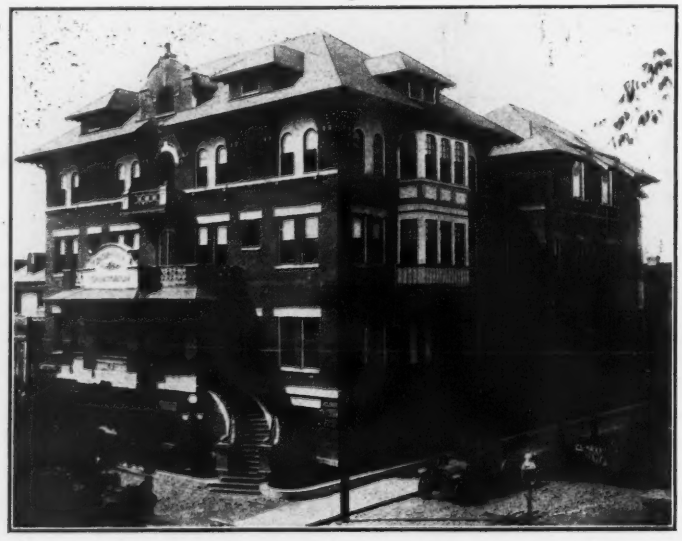

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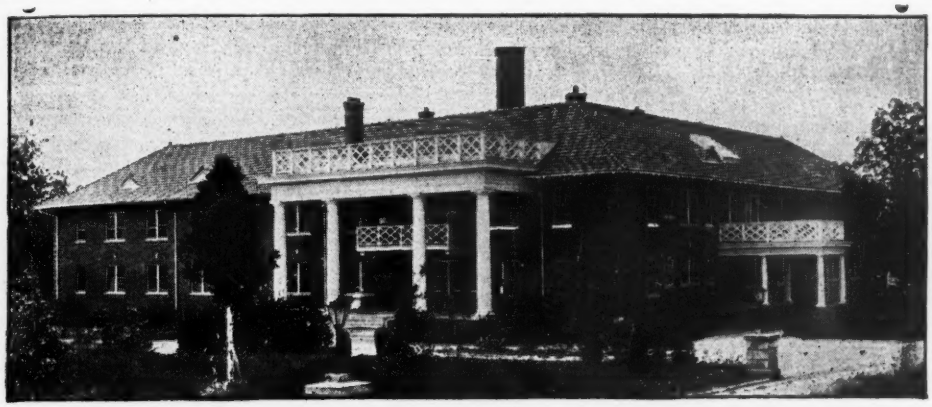

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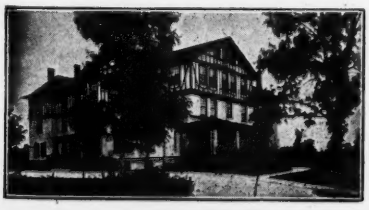

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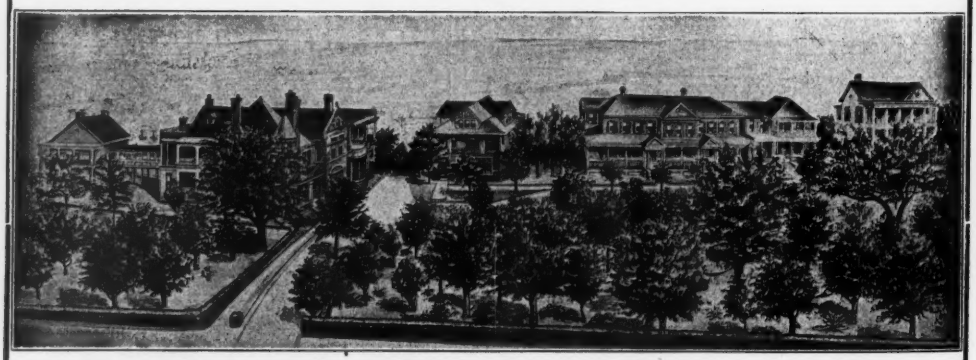

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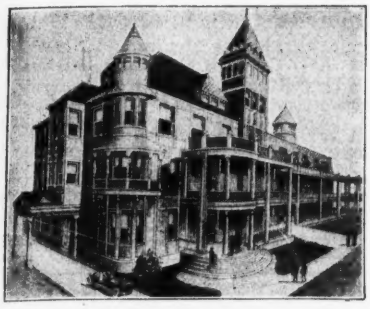

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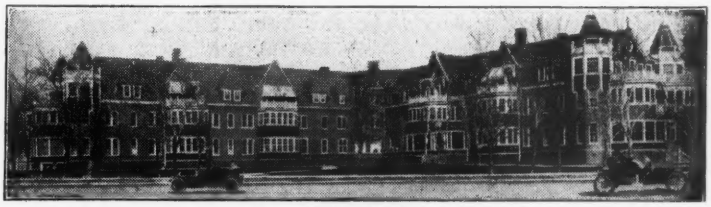

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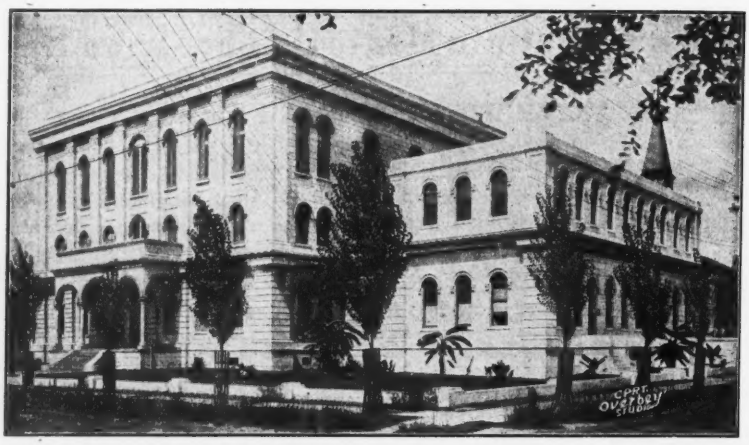

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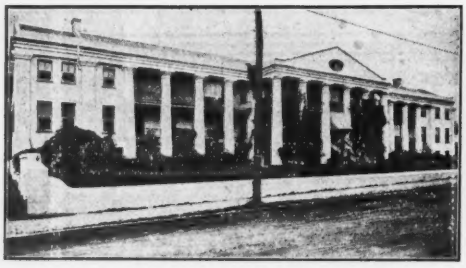

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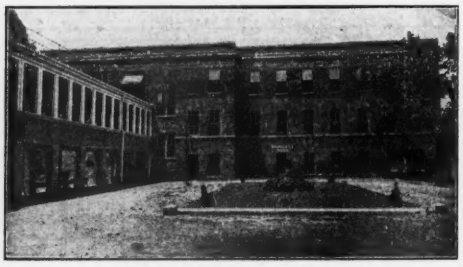

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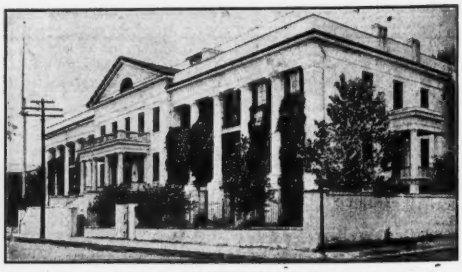

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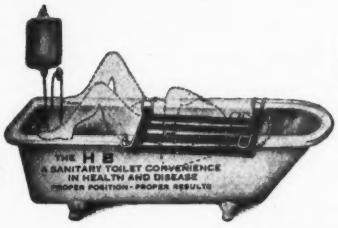


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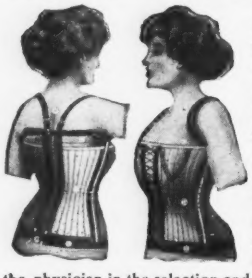

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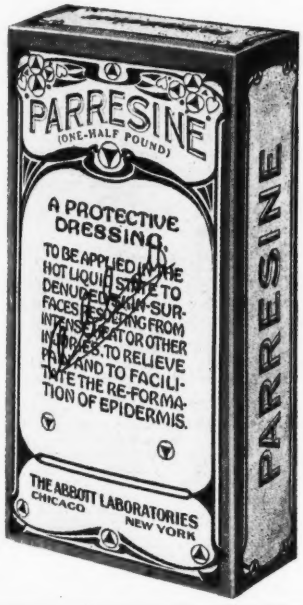
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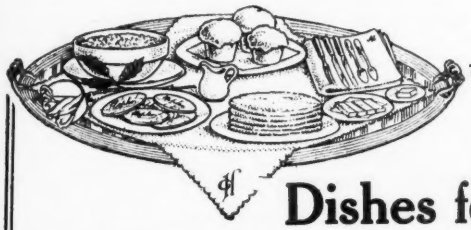

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SOUTHERN MEDICAL JOURNAL
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# MEDICINE

## INTERNAL DISEASES, PEDIATRICS, NEUROLOGY, DIAGNOSTIC METHODS, ETC.

### SOME OF THE PROBLEMS BEFORE US*

BY WM. WESTON, M.D.,
Columbia, S. C.

After years of agitation and effort on the part of the few pediatrists who are members of the Southern Medical Association, the Council, at its last meeting, decided to establish the Section on Pediatrics. The need for this Section has existed for several years, and of late because of the extraordinary growth of this specialty and of the increasing demand by the public for thoroughly trained and highly efficient physicians whose entire time is devoted to children's diseases, organization has become necessary in order that we may more fully understand the problems before us, and better fit ourselves to solve them.

From the first there has been a considerable difference of opinion as to how the pediatrists should organize, whether as an independent society or as a section of the Southern Medical Association. When we consider the multitude of societies already in existence that we are besought to join, most of them struggling despite some meritorious reason for having been organized, we should hesitate before further multiplying them, and at least try to strengthen an already strong society that is not only willing to support our efforts but is organized on a great scale to give such service to the people of the South as will enable them to assume their full responsibility to the Nation under whatever circumstances may exist. It is for us, then, not only to support this Association but to make our Section the chief cornerstone of the structure.

By the organization of this Section our first problem has been solved and we are meeting together for the first time as pediatrists to begin what seems an unusual opportunity for really constructive work. There is no region of our country that presents so many interesting and difficult problems to solve, and in no part does there exist to such a degree as here an opportunity for really brilliant research work.

Our greatest and most important problem is the reduction of the disgracefully high infant mortality rate in the South. In approaching this subject it must be evident to all who reside in the South that there are serious difficulties to overcome, but none of them is insurmountable if we have the courage to speak the truth, and possess the true scientific spirit. Our efforts for years to come must of necessity be pioneer work. We have much prejudice to overcome, many foolish traditions to break down and a great deal of educational work to do. Before we are in a position even to begin this work we must divest ourselves of the prejudices upon which we have been brought up and which have so largely become a part of our mental attitude.

The very high infant mortality in the Negro race is an inexcusable reflection upon us rather than upon the Negro. It is manifestly not within our province to

*Chairman's Address, Section on Pediatrics, Southern Medical Association, Eleventh Annual Meeting, Memphis, Tenn., Nov. 12-15, 1917.

help solve a race problem by tacitly permitting a high infant mortality. Aside from the moral view of this question it is a serious blunder to feel that we can save the white race in the South and neglect the colored. In order to protect one we must protect the other. If we stand aside and allow the Negro to perish in our midst it is inevitable that we shall perish with him. If, on the other hand, we go earnestly to work to stamp out those evils which imperil his existence, we shall render our race a service for which the need is most apparent. The high infant mortality rate in the white race here, it seems, would lead us at least to suspect that a white skin gives little immunity to diseases that are so destructive to the Negro race and that bacteria have no race prejudices.

I am comforted to believe that conditions as we find them are the result of circumstances that no longer exist and for which we are not responsible, and I am encouraged in the conviction that the time has come when we can review the past in a dispassionate frame of mind and profit by the mistakes of those who have gone before us. We no longer are the victims of great poverty that engendered so much social and political unrest in the South, and that for so long throttled every progressive movement. There were many enlightened men in our profession who earnestly endeavored to improve conditions, but were discouraged by lack of support. We have no such excuse, because we have many facilities with which to work which they did not have, and many intelligent people who are only too willing and anxious to co-operate with us in any scheme for the public good. It is our business to know about matters that pertain to the public health. We are familiar with the causes of infant mortality and it is our duty to teach the public what they are. People are eager to learn the facts in the matter, but are suspicious of theories. Ignorant people are always more or less skeptic and suspicious of what they term "ideas," but they are generally open to conviction, and once their confidence is earned they become valuable aids in conducting the work among their associates.

Where do we find the highest infant mortality? The answer is the same everywhere. Among the poor where the hygienic and sanitary conditions are bad, where the infants are improperly fed.

We are fortunate in possessing certain essential data. Given good surroundings, the breast-fed infant has a good expectancy. The infant who is entirely breast-fed for three or four months, then partially breast-fed and supplemented by properly modified pure cows' milk, has a good expectancy. The infant who is breast-fed for three or four months and then fed on properly modified cows' milk has a fairly good expectancy, while the infant that must be bottle-fed from the beginning, or is fed for a long period on proprietary foods, has a very poor expectancy.

We know that weather conditions have a pronounced effect upon feeding. We know that in cool weather an infant requires a relatively large amount of food and little water, while the reverse is true in warm weather. We know that in warm weather it is safer to reduce the fats and the sugars, boil the milk, increase the diluent, and lengthen the feeding intervals.

We know that in warm weather the infant's trouble is apt to be of the digestive system, and in cool weather of the respiratory system. We must teach, therefore, that if the baby appears sick in warm weather, stop food for a time and clear the intestinal tract and give water. In cool weather, when we may expect the respiratory troubles, do not neglect colds. We should teach that improper feeding may manifest itself in other ways than vomiting and diarrhea by rickets, scurvy, spasmophilia, acidosis, etc.

We know that as a direct cause of high infant mortality that the intestinal infections are more responsible than any other class of diseases, and that they are chiefly found among infants that are improperly fed. In my experience the one notable exception to this rule is the water-borne colon bacillus infections that are not uncommon in the rural districts. It is not unusual to observe severe epidemics of infectious diarrhea in the country districts and upon examination of the water supply find it loaded with these bacilli.

We must disabuse not only the lay but the professional mind of the erroneous

idea that in order that pneumonia be present a cough must exist. We know that in many instances broncho-pneumonia may be present and the physical signs are not elicited when its presence is demonstrated by the Roentgen ray.

It has recently been demonstrated that not an infrequent cause of a continued slight temperature may be diseased mastoid cells, even though there is no history of a suppurating otitis media. This is in some cases at least a cause which gradually undermines the system. I can not too emphatically urge the importance of a routine microscopical and chemical examination of the urine in both dispensary and private practice.

Thoroughness must be our watchword in the examination of patients in the dispensary as well as in our private practice. If we fail to use all the modern methods of diagnosis and treatment we can not expect successfully to attack the infant mortality problem.

It is our duty, as much so as the boards of health, to watch the milk supply and insist upon pure milk. We can not criticise careless dairymen too severely, nor should we stop short of driving them out of business. If we are to make real progress we must have pure milk at our disposal.

The question naturally arises: how may we make effective the knowledge we possess to reduce infant mortality among the poor? I think the thoroughly organized, well-equipped and ably-conducted medical dispensary answers this question. By thoroughly organized, I mean a sufficient staff of pediatrists, surgeons, eye, ear, nose and throat men, dentists and nurses. By well-equipped, I mean with laboratory facilities and a Roentgen ray machine, or the use of the latter near by. By ably-conducted, I mean examining each case carefully and skilfully, noting on the history and examination card every detail of the case. After a diagnosis is made and treatment begun, keep in touch with the case by having the child report at the dispensary at regular intervals. In the meantime have the nurse assist the mother in carrying out directions; have her note the hygienic conditions of the home and immediate surroundings. By her tactful conduct let her gain the confidence of the family and gradually improve the home conditions.

Classes for mothers is an invaluable part of the dispensary work. This should be conducted by one of the nurses, preferably the directress. In our work we also have classes for children whose duty it is to care for the baby while the mother is at work. We also have a day nursery, where we undertake to care for infants and young children while their mothers work. In order to encourage the mother to nurse her infant we serve her a noon-hour lunch. We try to make this lunch simple but very nutritious.

You will probably think that the plan that has been outlined is impracticable in moderate size communities. I can assure you that it is feasible in a community of five thousand people. While desirable, it is not necessary to start on the elaborate scale that has been outlined. The dispensary that has been described is the result of gradual development covering a period of several years.

Permit me briefly to review a few of the effects of this work, some of them directly, others indirectly, attributable to this focus of infant and child activity.

1. It has been the means of stimulating the profession to study children as they never have before. Several have gone on to the pediatric centres to pursue their studies in pediatrics and orthopedic surgery. Dentists have undertaken the study of children's teeth where before the only dental work that children received was extractions. Now we earnestly try to save every tooth.

We have noted marked improvement, and we hope real progress, in the treatment of throat troubles. Especially has progress been noted in the conservative treatment of tonsils. We do not allow tonsils removed unless they are really diseased, and when they are removed a complete enucleation is done. We try to keep in mind that large tonsils are normal in children, and that they are present for definite purposes that we know about and perhaps others that we do not know about.

Special training is given the nurses in children. We endeavor to give them the same course that is given them in one of the great pediatic centres of this country.

2. Because of the former marked frequency of malaria, pellagra and the general effect upon the public health, the community is now well drained and the industrial districts which were formerly notoriously bad have been sewered and the water supply made safe. As a direct result of this improvement we have been able practically to eradicate hookworm disease, the intestinal infections are much fewer, malaria is disappearing, and we feel that pellagra is being controlled. The general improvement of the population in these districts is most marked.

3. Perhaps the most important result of the work has been that the people are aroused to the good that is being accomplished. They no longer feel that a high infant mortality is the result of natural conditions. They have been convinced that a high infant mortality is the result of improper feeding, unhygienic surroundings, neglect and ignorance, all of them inexcusable and unnecessary.

I have already referred to the exceptional field that the South offers for research work. In the brief space of time that this address should consume I can only mention a few of the opportunities and in only a casual way.

The first one that I would call to your attention is pellagra. We see hundreds of cases each year especially from among the farming and industrial classes. We usually find this disease not only in well-nourished and well-developed children, but in communities where the hygienic and sanitary conditions are poor. We seldom find it originating in communities that are well sewered. We find it sometimes in breast-fed infants where the milk seems both abundant and normal, and where the parents appear healthy. It is protein in type. One season the skin manifestations may be marked and the child does not seem to feel ill, while the next season the skin symptoms may not appear of sufficient importance even to attract attention, while the child may be prostrated from a severe diarrhea.

There have been, as you are aware, a number of hypotheses advanced to explain the etiology of the disease, but none so far that investigation does not reveal to be probably fallible.

We are aware of the enormous tax that malaria exacts from the South each year. We have all seen apparently robust babies dead in a few hours from malaria. We are all familiar with malarial cachexia, with slight temperature, or sometimes a subnormal temperature where quinin seems to be useless. It is these cases where we do not find the plasmodia in the superficial circulation, but at the autopsy an examination of the blood taken from the spleen or some of the other internal organs reveals them by the hundreds.

Our knowledge of this disease is constantly increasing: two Noble prizes have been awarded for work done on it, and yet there is much about it that is still a mystery.

As important as are these diseases, they fade into insignificance beside the intestinal diseases in infants. Despite the splendid work of Czerny, Kellar, Finkelstein, and especially our distinguished guest, Professor Morse, to whom the world owes a debt of gratitude for their distinguished and brilliant work, yet we must assume from the unsatisfactory results in so many cases from whatever treatment adopted that there still remains much work to be done. Let us hope that from some of the investigations that are now being conducted along somewhat different lines there may at least come some additional help.

May I suggest that if any of you desire to undertake an investigation of intestinal infections you analyze the water, milk and other foods that the sick child has been ingesting? It is not safe to draw conclusions from examinations of the dejecta unless you have knowledge of the bacteriology of the ingested matter.

In conclusion, let us not forget that in confining our work to pediatrics we have assumed an obligation that requires our very best efforts; much is expected of us by the communities in which we labor. In no other field is there such an abundant opportunity for the diligent worker; for the man of vision; for the man who day by day grows in fitness.

It is, above all, the occupation of privilege, since our strength is so largely built upon service to the humble.

# THE ROLE OF CARBOHYDRATES IN INFANT FEEDING*

By O. H. Wilson, M.D.,
Nashville, Tenn.

Until 1906, when the work of Finkelstein, even though founded upon an error, opened our eyes to the potentialities of sugar, little attention had been paid to the carbohydrate side of infant feeding. The subject was usually dismissed with instructions to add enough lactose to make 7 %, or possibly simply to sweeten to taste. Sugar was a recognized food element, a necessary one, but was thought to give rise to little or no digestive trouble, and in our directions we were merely trying to follow Nature's model, human milk. This blind empiricism has been responsible for many errors in our first efforts at artificial feeding, so tardily discovered. The essential chemical and physical differences in fat and protein in human and cows' milk vitiated all experiments. If human milk had only been green or black, or in some striking physical respect different from that of lower animals, the science of artificial feeding would have progressed much more rapidly.

Physiology teaches us that all carbohydrates are utilized as dextrose, irrespective of the form in which they are given, their conversion requiring a more or less complicated digestive action. Dextrose might appear the rational form in which carbohydrates should be added if ease of assimilation were only to be considered, as it is ready for use simply by absorption. On the other hand, dextrose ferments readily and is quickly absorbed in the upper level of the alimentary tract, and hence is open to the objections that it may overwhelm the system with sugar and by its disappearance before reaching the lower level does not favor the normal growth of intestinal flora, which are left to feed upon the protein secretions. These objections are purely theoretic. Dextrose has not been given the study it deserves and it may yet find a place in infant feeding.

Among the disaccharides lactose is the universal form of carbohydrate in the milk of animals. This fact may be accepted as evidence of its value in the nutrition of the young. We have, however, learned that sugar digestion is not an independent function, but influences and is influenced by the digestion of fat and protein. In human milk these two elements are so different from those substituted from other sources in artificial feeding that it seems reasonable that other forms of sugar may prove as satisfactory as lactose, or even better in unnatural combinations.

Lactose does not ferment readily. It is split into dextrose and galactose, the process of splitting being rather slow, and continues throughout the alimentary tract, thus founding the claim that it favors the normal growth of intestinal flora.

Maltose, or rather dextri-maltose, as this is the only available form, easily splits into dextrose and dextrose, both molecules being available for immediate use, thus explaining the rapid gain in weight sometimes seen in poorly nourished babies when maltose is substituted for other forms of added sugar. Maltose seems frequently in some way to facilitate the digestion of fat. When dry chalky stools are seen with other carbohydrates a change to maltose may cause a smooth and pasty one. In my experience, though not borne out by others, maltose is decidedly the most laxative form of carbohydate.

Cane sugar has neither chemistry nor precedent to recommend it, though, practically, in normal babies it seems to answer every purpose. It is cheaper, more accessible and less liable to adulteration. It is a disaccharid splitting into dextrose and levulose, quite similar to lactose, but ferments more readily, is more quickly absorbed, and does not so well sustain normal flora.

The fact that starch-digesting agents are found in the secreting glands, even in the foetus, is interesting as a medical curiosity, contradicting the old theory that starch was a foreign body if fed before eight or ten months. This discovery has done little good in infant feeding; in fact, in the opinion of some, it had best remained unknown, as it may lead to the premature feeding of solids, much to the

*Read in Section on Pediatrics, Southern Medical Association, Eleventh Annual Meeting, Memphis, Tenn., Nov. 12-15, 1917.

detriment of the baby. If fed at all in the early months it should be only in the form of cereal water, used as a diluent instead of plain water, and then as a minor fraction of the formula. Little if any food value is gotten from starch, and that, only after a complicated digestive process.

Starch is valuable in other ways. Its slow conversion into dextrose leaves a favorable carbohydrate medium as the intestinal content, which usually hinders harmful bacterial growth. It may be laxative when cereal water is used as a diluent instead of water. It has a well-established efficacy in lessening the size of protein curd in cows' milk feeding. By its colloidal action it coats the intestines and acts as a protective, especially valuable in inflammatory conditions. Even when given for these purposes three-fourths of one per cent. is the best strength. The mere physiologic fact that the baby can digest starch does not make it desirable or advisable to depend upon it as a source of carbohydrates before six months, better ten.

Polycarbohydrates, indicating the combined use of several sugars and starches, succeed sometimes in difficult cases when babies have failed to gain on simple mixtures. Of course milk contains lactose, and hence the addition of any other form of sugar is a mixture of carbohydrate. Their combined use is impirical. This may explain the frequent unusual successful action of malt soup, with its maltose, dextrin and starch combined with the lactose present in the milk.

Carbohydrates are heat producers and fat storers. Their importance in nutrition is emphasized by the fact that over half of the solids of the human milk is lactose. It is certain that in a way carbohydrate may replace fat, with apparent temporary success. It seems to be a fairly easily digested class of foods even in disturbed conditions.

The tolerance of sugar varies with the individual. The observation of babies fed on patent foods gives valuable experience in high sugar feeding, which one would not dare try intelligently. Fat is difficult to preserve and patent foods rely for success upon the fact that most babies can take high sugar to compensate for the low fat content and thrive upon such mixtures, though rickets and scurvy may be lurking in close proximity, and there is imminent danger of a digestive upset starting with sugar intolerance.

The indications suggesting that the proper amount of sugar is exceeded are: loss of appetite, vomiting, increased flatulency and chafing acid diarrhea. These may come singly or all together, and if food is not changed produce a distressing diarrheal condition with general indigestion. While sugar may be the beginning of the trouble, digestion ceases and fat and protein both pass through unassimilated.

This is not an infrequent event in patent feeding and the usual course is to attribute the cause of the trouble to the particular food in question and try another, probably just as high in sugar content, though in a different form. The result is equally disastrous. The indications, of course, are to remove all added sugar and start on a very weak milk mixture. Buttermilk is especially successful in this class of cases. Unfortunately appetite is destroyed and taste perverted by the use of an excess of sugar, and it is often difficult to get them to take the unsweetened mixture. Here the use of saccharin seems to overcome the difficulty without detriment to the child. Recently I saw twins nine months old fed with apparently great success on malted milk, five level tablespoons to each feeding. While on a visit to the country, severe chafing diarrhea began. The attending physician, who evidently was a close reader of the advertising pages or on the principle that the "hair of the dog is good for the bite," fed them for a week with Mellin's food without milk, adding fuel to the fire. One baby died en route to the city, the other shortly afterward.

In ignoring patent foods we do ourselves a great injustice. They are going to be used by the profession or laity as long as printers' ink is cheap and no real substitute for human milk has been discovered. As each adjustment of food is an experiment, we should profit by previous trials of certain carbohydrates in their patent food feedings in making our formulæ. All patent foods go to the cow for fat and protein ,whether in the form of fresh or dried milk, and differ only in their car-

bohydrates. All take advantage of the fact that fat is difficult of adjustment, and that, in a large majority of babies, sugar tolerance is high, and with an excess of sugar they supplant most of the fat, giving frequently rolling fat babies, fit for advertising purposes. The maximum printed directions usually call for as much as 12 % of sugar.

It occurs to me that dextrose has been sorely neglected in the numerous experiments in this line. Being the ultimate form in which sugar is utilized, requiring no digestive action, it might be of signal service in building up undeveloped babies incapable of metabolism sufficient to appropriate more complex forms. It may be argued that its rapid utilization in the upper levels of the canal may starve normal flora.

There are many men registered in this Section, and I presume there are just as many opinions as to the proper use of carbohydrates. However, I shall venture the following statements which seem to me to be a reasonable exposition of my experience.

First, granting that one had the proper appreciation of the dangers and difficulties of fat, the adaptation and dosage of the carbohydrate is the determining factor in finding the proper food. Certainly, carbohydrate is the only element we can qualitatively modify.

Second, normal babies can take with equal benefit either of the three forms of sugar. Lactose seems possibly to suit very young babies better. Cane sugar suits older babies as well as any form. Malt sugar is indicated when others fail to produce a sufficient gain, or when malassimilation of fat is evident.

Third, the adjustment of the carbohydrate to a difficult feeder is an individual proposition, differing with each case.

Fourth, starch waters are valuable chiefly through their colloidal action. Any attempt to give enough to displace sugar is disastrous.

Finally, if a baby had the same trouble taking care of sugar that I have had trying to assimilate the confusing, contradictory, indigestible literature on this subject, I am sure he would cut it out altogether.

## DISCUSSION

*Dr. Arthur G. Jacobs, Memphis, Tenn.*—I believe that the role carbohydrates play in infant feeding is one of the most important roles played by any food element. I came here about ten years ago and found that practically all the babies were on condensed milk, which has been one of my best friends. It is, medically, the friend of most physicians, because it is responsible, I believe, for more gastrointestinal trouble than anything else under the sun. The percentage of sugar on which these babies were fed brought about diarrheas, flatulencies and fevers. Although this form of food may make the baby fat and apparently healthy, we, of course, all know that such babies are poorly nourished in spite of their apparently fat and healthy condition. They are pale and anemic and have no vitality or resistance, and I have found that the great mass of the trouble that I had in the earlier days was due to this excessive carbohydrate, and that condensed milk was responsible for more of this trouble than anything else.

Now, in combating that form of trouble due to a high percentage of carbohydrates (usually sugar), the pediatrist at that time would put the baby on barley water; and it was found, after considerable investigation, to my surprise, that some of the babies would not take barley water. Efforts were made, if the condensed milk did not agree with the infant, to put it on something else, and it was usually put on another high carbohydrate proposition, such as malted milk; and, naturally, no good results were obtained. So it was found that a high protein food containing practically no carbohydrate was a great boon in the treatment of these diseases; and I want to say that the bulk of my work was in cutting down the high carbohydrate in the condensed milk proposition and that I have been very successful in using high protein food. I could not get Edelweissmilch, but I found buttermilk to be my best friend. I have had more success in combating these high carbohydrate errors with buttermilk than with anything else that I have tried. I have found maltose and dextromaltose to be the best sugars. My success with milk sugar has been but limited. I have been discouraged with its use in feeding babies. I have found dextromaltose to be more easily assimilated and to produce less disturbance; and unless it were used in very great excess it was very satisfactory. It permitted of using a greater amount of sugar than any other form.

The baby, as Dr. Wilson says, can compensate for the lack of fat by the ingestion of a certain amount of carbohydrate, but only for a limited period. I have found it necessary to get back soon to the fat. The main point in the paper is that the carbohydrate, when used properly, is one of the most important factors in infant feeding. When used excessively it is responsible for more gastrointestinal trouble than any factor in the food.

*Dr. John Zahorsky, St. Louis, Mo.*—In the first place, we distinguish between dextromaltose and other malt sugars. We have made quite a series of experiments on the fermentability of the

sugars. Test tubes were inoculated with fecal bacteria with a certain percentage of carbohydrates added, and it was found that dextromaltose fermented about as rapidly as cane sugar, but that Mellin's food and malt sugar fermented much more rapidly. So if you want something to produce fermentation in the bowel, use malt sugar and Mellin's food. If you are afraid of this, give cane sugar, milk sugar or dextromaltose. Malt sugar is not so thoroughly assimilated as lactose. You never find lactose in the stools. On the other hand, dextromaltose is not so thoroughly assimilated. You can always find dextrin in the stool when it is given. Lactose is said to be more slowly absorbed. It has not been so far proved, but I believe that lactose, when associated with the elements of human milk, is quickly and easily absorbed, but that when it is associated with the albuminous substance of cows' milk it is more slowly absorbed. Usually it is absorbed before it gets down to the large intestine. If not, it is rapidly attacked by bacteria.

In infant nutrition I did not find any difference between lactose, dextromaltose and ordinary cane sugar, although some babies will take one of these more easily than the others.

We have also experimented to find the effect that proteins have in the fermentation of sugar. If you put in a test tube 5 % of lactose, dextromaltose or cane sugar, and put no protein substance with any of them, they do not ferment. You can not get acids in twenty-four hours. If, however, you add protein substances to the lactose and to the dextromaltose, and to the saccharose, then they ferment; and the more you add, the more quickly they ferment. Give a child on condensed milk a high sugar containing food and give that child a little more protein, and you will get intestinal fermentation. The assimilation and digestion of carbohydrates is dependent on the protein associated with it. That is why the curd of cows' milk is retained in the stomach, and meanwhile the sugar and whey content go into the bowel. If the sugar goes alone, with very little whey substance, or if the whey is curdled by heating, as in boiled milk, fermentation does not take place easily; but if there is a lot of the whey substance with the sugar there is likely to be a great deal of acid production and acid intoxication. Excessive fermentation of sugar in the intestine robs the intestine of alkali to counteract the fermentation and favors acid intoxication in that way.

The subject is interesting, because we are working on this point a great deal in St. Louis. We can not conclude anything about it yet. Let us all work on it. Everything has to be tested by the clinician. You can work in the laboratory all you want to, but if the thing does not work out clinically it is not worth anything. We, therefore, need careful work by the clinician, not only on sugar, but on what kind of combination with it—how much protein, casein and albumin, how used, and whether the latter was boiled, acidified or predigested.

I want to emphasize once more the point that dextromaltose is not easily fermentable. Why, we do not know. Mellin's food has a little more malt in it, but not enough excess to account for the great fermentability it possesses. Dextromaltose acts just like dextrinized flour. The malt is rather small; at least, the malt that favors the development of bacteria. But in malt soup and Mellin's food there is something that favors the development of bacteria. The thing that favors the development of bacteria often seems to favor the growth of the body. That may account for the apparent benefit from Mellin's food. This subject is exceedingly complicated, and we are just beginning to get to the point where we need more laboratory and a great deal of clinical experience, with accurate records of your clinical data, stating what you gave, how you gave it, how much you gave, and to whom you gave it. If a bowel is diseased and has infectious enteritis, if there is a secretion of leukocytes with mucus and serum in the bowel, it favors putrefaction; and if you give pure sugar, you have the conditions for rapid sugar fermentation, so that it produces diarrhea. If it is merely simple intestinal indigestion, the sugar may not have any effect at all. It is a question of how badly the bowel is diseased. That is one of the most important questions, the function of the bowel; and the carbohydrates must always be adjusted according to the kind and quality of the intestinal condition.

*Dr. Henry E. Tuley, Louisville, Ky.*—This is a very important subject. We are fortunate in having so careful a resume of the clinical, as well as of the laboratory side, of the subject from Dr. Wilson.

There are several points that occurred to me as he presented the paper, largely from the clinical side. I think that Dr. Zahorsky has very well said that the test tube experiment side of the subject, without its clinical side, does not amount to anything. Of course we are greatly indebted to the laboratory workers. I think that a great deal of the practical side of infant feeding has come from the laboratory work, but we can not rely upon that, because what takes place in the test tube will not always take place in the intestinal tube. The question of carbohydrate intolerance is largely an individual one—not only as to the clinical observer, but also as to the baby.

There are several important things that Dr. Wilson emphasized, and one in particular that impressed me, and that I had not thought of before, is the possibility of getting babies off a large quantity of sugar, such as babies that we have to get off condensed milk mixtures and put on other formulas, and are met with the impossibility of getting them to take a food that is not sweet by temporarily using saccharin, which makes any food that we give tasteful to them.

Another important point that he emphasized was the symptom of sugar intolerance. I think that oftentimes mothers do not realize the importance of reporting such conditions and the baby is in a serious state before it is brought to the clinician's attention. In important feeding cases, the help that we get from the weekly reports of the symptoms written out by the mother is very great, and often assists us in correcting disturbances that might get beyond control if not observed early enough.

Another important thing which I do not think the doctor mentioned, but which I have found of particular benefit, is the use of carbohydrate feeding in the new born. We have often to combat a very serious condition which develops during the first four or five days or the first week of life. Holt calls this condition "inanition fever." I have termed it "starvation temperature." Frequently the rapid loss of weight, which occurs during the first few days, and this temperature can be combated early, if we use a carbohydrate decoction of 5 % before we add the milk. This point I have noticed clinically but I have never been able to solve completely the reason for it. In my experience the fact that when cane sugar is used as the carbohydrate in this feeding, it shows with great frequency in the urine. Sugar is more frequently found in the urine when cane sugar is used than when any other form is employed. The use of cereal decoctions as a diluent in cows' milk feeding is of great importance, and often helps materially in taking care of certain formulas. One point that should be borne in mind is the advisability of previously dextrinizing these cereal decoctions or gruels.

*Dr. P. F. Barbour, Louisville, Ky.*—I think think that our respect for milk is growing from year to year. It used to be thought a very simple proposition to give milk to a child and have it grow. Fortunately, most children take any combination and do well on it, but it was a big step in advance when we began to discuss the individual elements of the milk, to find out just what the protein, the fat, the carbohydrate and the salts did. Now we are going a step further and finding that it is not a question of the digestion of the individual element, but of this element as affected by the presence of other elements in the milk. We can not take carbohydrates and divorce them from fats and proteins and get a true picture of digestibility. We have to study the milk as a combination.

The essayist has brought out the valuable point that there are certain things that point toward sugar indigestion, and that when we have these we are warranted in lessening the amount of sugar to the point of tolerance in the child. The digestion of starches and sugars seems to be almost an elemental property of the cell. Nature has indicated to us that these are to constitute one of the chief foods always in life. Practically, almost uniformly, cells are able to digest starch. That is why we have such a large tolerance for sugar.

It is unfortunate that we can not look at a child and say what combination will suit it. We can not tell beforehand what kind of sugar will agree with it. I have had a child get stomach ache on lactose. I gave cane sugar and stopped the pain. The same thing happened in another case when I was using cane sugar. I gave lactose and stopped the trouble. We have no good explanation for this. We must study the individual case. Lactose is the best sugar, but if the child can not take this we should try dextromaltose or cane sugar.

Dr. Wilson said something about the use of dextrose in infant feeding. There is one thing, it seems to me, that we must remember in giving any kind of milk to the child, and that is not to give a mixture that is too easily digested. We need the stimulation of the digestive force to build up the child into a robust constitution. If you give a food that is too easily digested, it does not get the brawn and power that a child fed on a milk mixture less easily digested will get. If you feed the child dextrose it will fail to get that stimulation of pancreatic secretion which comes from giving a food requiring pancreatic secretion for its digestion. If you have a child with sugar intolerance, it will do pretty well on buttermilk in most instances, but you must soon get sugar back to such children. You must educate the child just as you educate a diabetic to use starch in its sugar digestion.

*Dr. William A. Mulherin, Augusta, Ga.*—Dr. Wilson said there is a great deal of confusion existing in the literature about the role of carbohydrates in the digestion of infancy; and yet, accepting this as true, there are a few well-established and fully-accepted facts that we all know concerning the use of carbohydrates in infant feeding. One important fact, as Dr. Barbour has mentioned, concerns the relative importance of carbohydrates as one of the chief ingredients of mothers' milk.

As you all know, mothers' milk contains fats 3.50 %; carbohydrates, 7.50 %; protein, 1.25 %; salts, 0.20 %. There is a larger percentage of soluble carbohydrates in mothers' milk than all the other ingredients combined. Now, as the good Lord is omniscient, and therefore the best of baby feeders, we must accept the conclusion that carbohydrates are a most valuable ingredient in infants' food.

A physiological study of the ingredients of mothers' milk also teaches us a few facts. We well know, from physiology, that the fats in mothers' milk are intended for the generation of heat and the storing up of fats in the baby. The carbohydrates, likewise, serve the same purpose of generating heat and storing up fats in the baby, and are therefore interchangeable with the fats as a temporary measure. Proteins, we likewise know, are the most important ingredient in mothers' milk, their physiological purpose being for cell proliferation, for generation of blood, and building up of tissues in the child. Therefore, carbohydrates play an important role, as a substitute for fats, in a sick baby's diet, where the fats necessarily have to be made low; and serve the additional purpose, together with fats, of relieving the proteins of the necessity of generating heat and storing up fats in the child, thereby giving the proteins clear right of way to utilize their full force for the growth of the baby.

Again, in acidosis, carbohydrates serve a useful purpose. They are considered to be the flame to burn up the fats in the process of metabolism, and therefore prevent the formation of the acetone bodies that are found in acidosis. If we have not a sufficient amount of carbohydrates in our diet, we have a smoldering process, which gives rise to the formation of acetone bodies, with the resulting acidosis.

As Dr. Barbour states in his discussion regarding the use of soluble carbohydrates (sugar), I

heartily agree with him that the particular kind of sugar to give a baby depends upon the individual child, the whole matter depending upon the individual tolerance, or intolerance, for certain sugars. If we follow the dictates of Nature we shall be led to sugar of milk as the sugar of election, because this is the sugar we find in mothers' milk and in cows' milk. In the use of insoluble carbohydrates (starch) again we have a difference of opinion as to the time for using it. Dr. Abraham Jacobi strongly advocates the use of barley water as a diluent from birth, while equally as good authorities do not advise its use before the fourth to sixth month, and here again the individuality of the child plays an important role, as some babies do well upon it from birth while others do not.

As regards the easy assimilation of carbohydrates, I think we have a very practical example illustrating it by the popular use of proprietary infant foods. We all know that as a general measure it is the most easily digested ingredient found in the infant's food, for if this were not so there would be no patent foods on the market. It is needless to add that they are bad permanent feedings on account of absence or great deficiency of the fats and proteins.

If I understood Dr. Hill correctly, he stated that it was high proteins and high carbohydrates that caused diarrhea. I feel that I must take exception to this and state that my impression is that it is high carbohydrates and high fats in the great majority of cases that form fatty acids and therefore prove to be the most important factor in producing diarrhea in infancy. Also, as to Dr. Zahorsky's remarks in this discussion, I was led to believe, from what he said about his experiments with carbohydrates and proteins, that he was inclined to the belief that the proteins were instrumental in causing fermentation and diarrhea in his little patients. We all know that proteins are considered anti-fermentative and not fermentative, and therefore, instead of producing fermentation, they should have the directly opposite effect in preventing it. This anti-fermentative effect of proteins is in keeping with Finkelstein's theory in his albumin milk and I feel quite sure that Dr. Zahorsky's findings will not be found in thorough accord with present theory and knowledge. In this connection it might be stated, when we are inclined to blame this or that particular ingredient in the food for indigestion or diarrhea, it is well to remember that a sick baby and a well baby are entirely different as regards their tolerance for the different ingredients; and even in the well baby the individuality of the child is an important factor as regards its tolerance or intolerance for the different ingredients of the food.

*Dr. Wilson (closing).*—I always used to believe in buttermilk, but it is a very hard thing to get. Coming as I do from a rural district and having recollections of the labor involved in the process of churning, I never liked to ask women to churn; but a woman told me how to make buttermilk without much trouble. She bought a quart of milk, let it sour, put it in a half-gallon fruit jar and shook it; and in five minutes she had an eighth of a pound of butter and good, fresh buttermilk. I have tried this many times successfully. I say that it takes five or ten minutes, but she said five. This is so very different from my early recollections of the ordinary process of making buttermilk that I do not now hesitate to ask mothers to make it. They do it willingly, and it has been a God-send to me in handling fat intolerance.

No one except Dr. Barbour mentioned dextrose. My idea in the use of dextrose was not its continued use. I believe, as all do, that the use of anything to lighten the labor of any digestive process is liable to cause an atrophy of the process; but my idea was, as I mentioned, to use it in the case of under-developed babies with a low power of metabolism. In order to work them up to a strength in which they are capable of digesting milk mixtures, would it not be a good thing to add a little dextrose to the milk formula? I do not know about that. This paper should have been written by a laboratory man. I am not one, but strictly a clinician. I wish I were. I see a lot of things that I should like to investigate, but I have no time to work them out and have to ask some one else to do it for me. I should like to have some laboratory experiments made on dextrose. I believe that it would be good for the class of patients mentioned. It probably would be too quickly digested for continued use, because it requires practically no digestion before its absorption.

## PRESENT ATTITUDE TOWARD PROTEIN AND FAT*

By Oliver W. Hill, M.D.,
Knoxville, Tenn.

Since proteins have become so much maligned, and blamed for so much trouble in feeding infants, and then by some absolutely absolved from any blame whatsoever, attributing their digestive disturbance to fats and carbohydrates, I am inclined to the opinion that the pendulum with some has swung too far, and that the question may well be asked: What is the present attitude of pediatrics toward proteins? What is the concensus of opinion as to the role they play in our feeding problem? I shall discuss very briefly the physiology of protein digestion, absorption, and its influence upon metabolism.

The most noteworthy thing about metabolism with food is the peculiar position which proteins occupy with reference to other organic foodstuff. If a dog be given a sufficient quantity of protein with no

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fat nor carbohydrates under proper circumstances the body will remain in a state of equilibrium of substance, the ingesta and the excreta completely balancing each other. If, however, the dog be given carbohydrates and fats in plentiful quantities but no protein, equilibrium never occurs. The body continually excretes nitrogenous waste products, which means that protein is continually being destroyed, and after a time, which is somewhat longer than when no food at all is given, the animal finally dies of "protein starvation."

All animal nature is in a continuous state of unestablished chemical equilibrium, building itself up on the one hand and breaking down on the other. Now what is the result of an excess, or a deficiency of this food element, and just what constitutes a correct proportion in feeding of infants and young children?

We know that children require larger amounts of protein as compared with the adult who usually consumes more than he actually requires or can care for without injury to his kidneys.

It is evident that the growing body needs relatively more food than the adult, both because it is smaller and because its organs must increase in size. Moreover, experiments have shown that the young body has more active metabolism per unit of body surface regardless of its smaller size.

The digestion of protein begins in the stomach. In 1936, Schwan found a substance which produced chemical changes on food, which he called pepsin. Under this name is the enzyme which acts in acid medium upon protein gelatine and connective tissue, causing these to absorb water and split into simple compounds. Pepsin has no effect in an alkaline solution and is dissolved in a soda solution.

Cornsart, in 1857, isolated the proteolytic enzyme of the pancreas, trypsin. It does not occur as such in the pancreas, but instead zymogen which, like those enzymes, is more resistant toward all kinds of injurious agents than the enzyme itself. But even the juice does not contain any trypsin and is entirely without effect upon proteins if it is not activated by an enzyme called enterokinase found in the intestinal juices.

Undoubtedly each one of us varies in his interpretation of the clinical symptom of excess or insufficient amount of protein. In other words, the general syndrome indicates to you what you consider the next move in the way of adjusting the food formula of the infant. However, I shall tell you briefly what my conceptions are. It is very difficult to express these changes in words that will in any way convey our whole vision. Most of us have to depend principally upon clinical pictures, a primitive method to depict these changes.

We have all heard the term "food injury" and most of us have our conception of what is therein designated. However, we all know that we can be led easily astray by the very term, from a clinical picture.

We had to learn that the very fact of having deficiency of any one of the food elements might bring about this condition of food injury as well as having an excess.

Finklestein used the term "disturbed balance," trying to imply a disturbed balance between the food elements and the body; but in his own words "the term is colorless" and he thereafter adopted the term "alimentary dystrophy," which only suggests after all what he is evidently trying to say, a poor condition of the digestion, including the action of the various digestive secretions and absorption. In other words, metabolism, a "vitiated metabolism," seems to me to convey better the idea.

When an excess, — and by excess is meant an excess for the individual, which in reality may be a small amount—of protein is fed to an infant, tolerance may persist for a brief period, to be followed by digestive disturbances and interferences with nutrition. Protein excess is rarely marked by vomiting unless the amount be so large that its speedy coagulation is followed by ejection from the stomach in the form of a tough, leathery mass within a short time after feeding. The main features of the disturbance are confined to the intestinal tract. The stools are usually loose and green. They have an unpleasant but rarely foul odor and contain considerable mucus and white or whitish-yellow masses of undigested calcium paracasein (curd). These masses may exist in an otherwise normal stool.

This is not indigestion, but non-digestion of relatively too much curd. In this instance the curds act as a foreign body, and if their presence persists they may cause serious intestinal irritation. These symptoms resemble the dyspepsia of Finklestein, described by him as due to excessive fat or sugar. As you of course know, the masses may be distinguished as being protein by the xanthoproteic test.

In other instances, where too much protein is being fed, constipation exists and the movements are hard, whitish, dry, and readily crumble. They are passed with considerable effort, as a single mass covered with mucus, which may be blood-stained. Stationary weight or a loss is recorded in both these types of protein intolerance. The urine is often scanty, highly acid and deposits of uric acid and urates are noted on the diaper. The temperature ranges in these cases may be slightly above normal.

I shall attempt no discussion of protein with relation to the so-called "food eczemas" other than to state that I do not consider them so important nor so often the offender as the other food elements, fats and carbohydrates, although Finklestein often speaks of the exudative diathesis in discussing proteins.

At one time I was of the opinion that protein was the principal cause of that intestinal disturbance of infants sometimes called three-months colic. However, I have seen proper to change my mind. I do not agree with that school which held that a tough casein curd can do no harm. On the other hand, I am very sure that they occasionally do great harm in certain individuals. And when this condition does maintain I believe it is of greater importance than any of the food elements. In the above I refer to the breast-fed infant.

Now with cows' milk the case seems to me entirely different, as I believe milks are suited to the species, and it seems to be undoubtedly true that the curd determines the future character of the gastro-intestinal tract and prepares it for the food which it will receive in adult life. Chapin says that the intestinal development depends upon the nature of the curd. We must remember in feeding the protein of cows' milk that Nature intended it for the development of the gastro-intestinal tract of a calf into that of a cow, and therefore is suited to the digestion of a bovine. Whereas human milk is intended to develop the stomach and bowels of a baby into those of a man, consequently it is more suited to the infant.

It behooves us, therefore, to feed our cows' milk protein carefully, always bearing in mind that in so far as the baby is concerned it is an artificial food and in some ways unsuited to his digestion and assimilation. Remember that you are going through a process of education of his digestion. And in order to satisfy an exacting and ambitious mother, do not crowd your "little fellow" and in the attempt to gain a temporary advantage do permanent injury to his intestinal tract.

Where there appear unusual difficulties there are several ways of dealing with these tough curds. But that does not come in the province of this paper. Suffice it to say that the curd may be attenuated by the use of cereal water or gruel, either plain or dextrinized, as may be indicated. It may be at least partially prevented from forming by the use of citrate of soda. Pancreatization and sterilization may render the curd more digestible. If the worst comes, you may entirely eliminate the calcium paracasein by feeding whey when there is an evident absolute intolerance to protein.

When possible one should gradually increase the bovine protein as the educative process progresses until a quantity equal, or somewhat greater, than that found in human milk has been reached, for the reason that after all our principal problem is to get the child to assimilate a sufficient amount of protein to cause a consistent gain in connective tissues and muscular strength. We must always be guided by the digestive powers of the patient under consideration, and not by what the books say of calories and percentages.

The conclusions arrived at are these: protein has been grossly misunderstood from the standpoint of normal physiology. It is as much influenced by the individual tolerance or susceptibility as is either of the other food elements.

We are learning something of the position of this element and are recognizing the fact that after all is said more depends

upon the management of the case and the manipulation of the food than in the actual food itself as to how we succeed; because a given protein, whether cows' milk or human milk, is practically the same under all circumstances as to chemical constitution, digestibility, etc. Whereas the digestive apparatuses of no two individuals are identical, and the digestive ability of the same individual is not the same for any given length of time, even if conditions are the same at all times, which of course they are not.

Finally, allow me to make the following observation, which I am sure all good pediatricians will appreciate: Most failures of feeding are not due to the food, but to the feeder.

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## DISCUSSION

*Dr. Samuel M. Bloomstein, Nashville, Tenn.*—When I started to practice we were taught that it was the proteins that caused most of the harm, the fats and carbohydrates causing little or none. A little later on it was said that the proteins were almost harmless, but that it was the fermentation and decomposition of the fats that gave the trouble. Still the carbohydrates were considered innocent. Now within the last few years there has been more said on the subject of the carbohydrates, so I really do not know "where I am at."

I do know this: that every case is a law unto itself and I do not believe that you can lay down any hard and fast rules for the feeding of all children. If you will pardon me, I shall relate briefly a case I had. At that time in my early career I was wedded to Holt's plan of percentage feeding. I had been working with him and had adopted his views. I had as a patient a little fellow to whom I could give as much as 1% of protein, 2% of fat and 5% of sugar. Every time I would get him over that, off he would go and have an attack of diarrhea; and I would have to start all over again and put him on the usual barley water employed at that time. He would be all right again in a few days, and I would start on my formula and work up gradually, but every time I would get above those percentages he would have diarrhea again.

One day his mother went to the city and left the child in charge of her sister. On my next visit I found the little fellow much improved, and the next day when I went the child was still better. His aunt said to me: "Are you really satisfied with his progress?" "Yes," I replied. "Well," she said, "I took advantage of my sister's absence to give the child some undiluted boiled cows' milk. I have been giving it to him since and he has thrived on it." He continued to thrive and got well; and he had been a very sick baby.

I have had other experiences similar to that, and really I do not know what to say. As Dr. Barbour, I think, said, a well baby can take almost anything and thrive, but a sick baby is a different proposition. You can not feed a sick baby as you would a well one, and I do not believe that for very long you can substitute any one element in the food for another and have the child thrive as it should. I think that you can substitute carbohydrates for protein for a certain length of time with a probable good effect; but the time will come when, if the child does not get sufficient protein or fat, or carbohydrates, it is going to suffer. When it is all narrowed down it is seen from the experiments of the laboratory man and the observations of every one else that the main thing is to get the proper combination, and I do not believe that you can feed any two sick babies exactly alike. Each is a law unto itself and you have to learn the combination that suits each individual case.

*Dr. Frank P. Gengenbach, Denever, Colo.*—Dr. Hill has left little to add, except to commend his paper and to emphasize some of the points that he has brought out. As Dr. Bloomstein has said, first it was the protein; then it was the fat; and then, the carbohydrate and, in some cases, even the salts that were supposed to be the principal disturbing food factors. We now understand that it is not any individual element, so much as the combination of these elements; that one element if given in about proper proportion, seldom causes disturbance. If, however, we have one element in excess and go beyond certain limits with any other element we get an upset.

It is seldom that we get protein indigestion when we give milk modifications with the percentage of protein necessary to prolong life and encourage growth; and if we stay at this point we should get no disturbance from the protein except perhaps in cases of protein sensitization.

*Dr. J. D. Love, Jacksonville, Fla.*—Some years ago it was my pleasure to attend a meeting of the American Pediatric Society as a guest of that Association. A paper bearing upon the subject of protein was read, and, much to my surprise, this paper elicited only a very meagre amount of discussion. I commented on this afterward to a friend and he said: "Doctor, we have had this thing threshed out time and time again. Every one knows the attitude of each of the others concerning it; and now every one is afraid to 'start something that he can not finish.' If we were all to express our opinions relative to protein, we could hardly finish the discussion today."

But I want to make a few remarks relative to protein as administered to the sick child. Dr. Graham Lusk states that in order to know surely the action of protein, we must understand the life history of fourteen amino-acids that enter into the composition of protein. I would go further and say that we must know this not only in normal, but also under abnormal conditions. I have a wholesome respect for protein, because I recognize that in cases of bacterial infection it is pregnant with possibilities for very material damage.

Some years ago an instructor of mine illustrated its harmful effects in this way: "If we put milk in a test tube and mix it with normal digestive fluid we know what happens; if we feed milk to the child, thus adding normal digestive juices and the bacteria normal to the intestinal canal, only God knows what happens; but if we feed it to a sick child, thus adding abnormal digestive juices and pathologic bacteria, then God Himself does not know what will happen." This illustration, profane as it was, made an impression upon me, and when I see a child sick with infectious diarrhea and the child is fed a bottle or two of milk and goes into convulsions or promptly becomes toxic, I think of the teaching of this instructor and recognize the fact that what was true twenty years ago concerning protein and milk is just as true today.

*Dr. William A. Mulherin, Augusta, Ga.*—I do not wish to discuss every paper read, as I am inclined to think that we all, at times, do too much talking. But I do feel that this discussion, up to the present time, has "made a goat" of proteins, and, I might add, very unjustly, according to facts as they exist. I must confess I am not in accord with the impression left concerning proteins. I do not know of any reliable data that can be produced to substantiate this impression that the proteins are so badly to blame for the various troubles in infant feeding. If I recall correctly, Holt claims that the old idea that the proteins of cows' milk were very difficult to digest and caused a great deal of trouble in infant feeding, has not been substantiated, and to the present time has not been verified by any reliable data.

It is true that there is a good bit of confusion about indigestion and non-digestion. By non-digestion of proteins I mean large curds appearing in the stools without any constitutional symptoms; and indigestion of proteins when large curds appear in the stools with constitutional symptoms. I believe that proteins are blamed at times when non-digestion only appears. Non-digestion does not amount to anything more than a foreign body passing through the bowels.

Dr. Hill very properly has stressed the importance of protein in the baby's diet, for we all know that it is the most important ingredient, and the only ingredient that can repair the nitrogenous waste of the body. It might be well to ask those who think proteins are so harmful, why do we give babies skimmed milk preparations, which are high in protein, and see them get well? Again, the question might be asked, why does Finkelstein, or protein milk, which is 3.75 % protein, prove to be so efficacious with diarrheal troubles in babies?

In the discussion, some one mentioned the fact that proteins caused foul-smelling stools and inferred from this that they were injurious and necessitated purgation. It is well to remember that when proteins are high in a baby's diet that they make an alkaline stool and putrefaction does not exist, which gives rise to a foul odor; but that any harm results from this is very questionable. We all know that buttermilk, which is high in proteins, will usually cause foul-smelling stools. It is well, in such cases, to add a generous amount of carbohydrates for the purpose of causing fermentation, which stops, in a great measure, the putrefactive process in the bowels. The old idea that an excessive amount of proteins in a baby's diet throws extra work upon the kidneys, and does harm in this way, likewise lacks confirmation.

It might be logically asked why does not Nature provide a greater amount of proteins in mothers' milk if the baby's system requires it? In answer to this it may be said that the proteins in mothers' milk contain a much greater amount of the essential amino-acids, and therefore a smaller amount of proteins are required when mothers' milk is used. The reverse obtains in cows' milk, which is quite deficient in certain essential amino-acids, and therefore a larger amount is required for tissue building and replacement of nitrogenous waste of body.

*Dr. John Zahorsky, St. Louis, Mo.*—We have gotten away from the idea that, in the so-called simple malnutrition of babies, with hard light-colored stools (the soap stool), the fat has not been absorbed; for analysis of the soap stool does not show the presence of any more fat than usual. I think it has been shown that there is always a little protein in the stool of the baby artificially fed, and this little amount of protein may really do harm. I am inclined to believe that we shall really come back to the idea that malnutrition in the baby is not due to fat; but that malnutrition, with its hard, offensive, light-colored stool, shows increased putrefaction.

Protein favors the fermentation of the carbohydrates; and so the protein is also concerned in the diarrhea. It is the little broken up masses, and even some of the amino-acids, that favor fermentation.

In Eidelweissmilch, which is fermented milk and has little sugar, the acid albumins probably do not favor putrefaction or fermentation.

In future, when speaking of protein digestion, we must speak of the kind of protein. There is a difference between acid protein and neutral protein. We can modify diarrhea by handling the protein. There is no pure protein indigestion or fat indigestion. It is in the combination. The protein has its part. Without it, most of that process of putrefaction can not take place. Leave out the sugar and the fermentation stops. Many leave out the protein instead, and in both cases the babies get better. Some give fat and the babies get better. In all these cases the improvement takes place because there is not the combination to produce fermentation. If you leave out one element the others work finely. Cutting out fat improves the digestion of protein. Taking out protein permits you to give more carbohy-

drates safely, and taking out carbohydrates allows you to give more protein safely. The correlation of the food elements deserves more attention.

*Dr. Hill (closing).*—I appreciate very much your liberal discussion of such a paper. But really you discussed the food and not the paper. I must say that I think that the majority who did discuss it really missed my main point. That is, that it is not the food element that is at fault. We are not trying to blame or exonerate any one food, but to find the place that it occupies, not with a sick baby, but with a normal baby. To do this, you have to educate pediatrists. There are many changes in opinion among them. For instance, Dr. Holt has three minor changes in the four editions of his book, consisting in readjustment of what he thinks about protein, fat and sugar, because we are all learning all the time.

As far as cutting out one food element entirely and giving another is concerned, that would depend upon the child. Some children have a peculiar ability to digest fat; while others can take only a very small amount of fat. One child can take protein readily, while another can take only a relatively small amount of it. Of course, our idea is to feed the child as much protein and fat and sugar as he can assimilate and increase in weight normally. That depends upon the individual child as much as upon the milk. I know one child that I have never been able to get to take over 2 % of fat, but a high per cent. of sugar. If I feed more fat he has eczema immediately. I know other children who can take high percentages of protein without eczema or exhibiting anything in the way of an acidosis. One child would develop acetonuria if I fed as much as 1.25 % of protein.

My suggestion about feeding more proteins in cows' milk was made because the protein in cows' milk is not so digestible as that in mothers' milk; and you want the child to digest as much protein as it can. The protein injury, I am sure, exists, because you know that protein idiosyncrasy exists to adult life. Even after adolescence this idiosyncrasy to protein is still carried on. As to the proof of this injury you only have to study the child carefully with protein to see this. I made the experiment of feeding children for a long time with protein. We watched the stools and weight for weeks and found that you can do injury and get mucus and blood, as well as influence the weight. It certainly does demonstrate itself. Never mind the laboratory test. If you feed sufficient sugar to make the combination correct, that will not exist. You want to make the combination of all the food elements, but as to what position peculiar food elements occupy, whether protein is to blame for these things, and how much one can feed without injury to an individual case, no man can tell.

As far as Edelweissmilch is concerned, I prepared it for a year for my patients, but I found that you can get as good results by boiling skimmed milk when Edelweissmilch is indicated.

The results are the same, because you have the fermentation cut down and the fats removed.

One other thing: as to the influence of foods that have high proteins I do not know. I believe that proteins do not play the part in eczema and diarrhea that fats and sugars do. I believe that they play more part when the child suffers from malnutrition and has a lowered temperature. The child needs the protein in order to get a normal gain in weight. Without it you get a fat child but not a firmly resistant child, as you have when protein is well assimilated.

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# THE CLASSIFICATION AND TREATMENT OF THE ACUTE DIARRHEAL DISEASES IN INFANCY*

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The classification of the acute diarrheal diseases of infancy which I am in the habit of using is based, in a general way, upon their etiology. This classification is at best a rough one and is open to much criticism. It is assumed in this classification that in a general way diarrhea may be due to a simple mechanical disturbance of the function of the intestines, to a disturbance of the chemistry of digestion, to abnormal bacterial activity in the intestinal contents, and to infection of the intestine itself by bacteria. The classification is, therefore, as follows:

A. Nervous Diarrhea,
B. Diarrhea from Indigestion,
C. Fermentative Diarrhea, and
D. Infectious Diarrhea.

It is self-evident that in many instances it is difficult to draw a hard and fast line between these classes and that they must necessarily overlap and merge into each other. Nevertheless, in spite of the many objections which may be made to this classification, it does, however, furnish a reasonable basis for diagnosis and has proven itself most useful as a guide for treatment.

## A. NERVOUS DIARRHEA

Diarrhea may develop as the result of causes or conditions acting directly upon

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the nervous system. The diarrhea is due to increased intestinal peristalsis resulting from a disturbance of the mechanical function of the intestines because of abnormal influences transmitted to it from the unduly irritable or exhausted nerve centers. If there is also a disturbance of the secretory functions of the intestines, the symptoms are indistinguishable from those due to disturbance of these functions from other causes. In fact, the condition is an indigestion. The most common of the causes of nervous diarrhea are extremes of temperature, whether of heat or cold, more commonly of heat. Excitement and fear may act in the same way as extremes of temperature. It is conceivable, also, that indigestible and unsuitable food, acting simply as a foreign body, may by irritation of the intestines reflexly produce diarrhea, without causing any disturbance of the functions of digestion. If this happens, however, it must be very seldom.

The diarrhea being due entirely to increased intestinal peristalsis, the stools show no evidences of indigestion, except in the rarer instances in which the cause is improper food, when this food will be found undigested in them. They are normal in every way, except that they are increased in number and diminished in consistency. The body temperature is not altered in these cases, but there may be more or less abdominal discomfort and constitutional depression.

The prognosis is, of course, good in nervous diarrhea, the only danger in the condition being that it predisposes to indigestion and infection.

The first and most important part of the treatment consists in the removal of the cause. If this is indigestible food, a laxative, such as milk of magnesia or phosphate of soda, should be given. Otherwise, a laxative is unnecessary. It is advisable to omit one or more feedings and then to weaken the food for a day or two. If the baby is on the breast, this can be done by shortening the duration of the nursings and giving boiled water before or during the nursings in order to dilute the milk. If the baby is on an artificial food, the food should be diluted with water. If it is on a mixed diet, the less easily digestible articles should be omitted.

If the diarrhea is not due to indigestible food and there is a large number of stools, normal except as to their consistency, it is not only allowable, but advisable, to diminish the excessive peristalsis by giving paregoric, in doses of from 5 to 20 drops, every two to four hours, according to the age of the child and the severity of the symptoms.

### B. DIARRHEA FROM INDIGESTION

Diarrhea resulting from indigestion may be due to an excess of an otherwise suitable food, to an over-rich but otherwise well-balanced food or to an excessive amount of one or more of the individual food elements in the food. It may also be caused indirectly by other diseases — parenteral diarrhea—or by any condition which weakens the digestive powers or lowers the general resistance. Diarrhea from indigestion in the breast-fed is most often due to an over-rich milk or to an excess of protein. In the artificially fed it is most often due to an excessive amount of food or to an excess of fat or carbohydrates in the food. It is assumed that in diarrhea due to indigestion the symptoms are all due to a disturbance of the chemistry of digestion and that bacteria play no part in their production. This assumption is, of course, not strictly true, because fermentation as the result of bacterial activity in the intestinal contents takes place under normal conditions and is probably exaggerated in indigestion.

The pathological changes in the intestines are insignificant. In many instances there are no macroscopic changes. In others there is reddening of the surface and an excessive secretion of mucus, while in a few there is a desquamation of the superficial epithelium. The microscopic changes are slight and unimportant.

In all cases of diarrhea from indigestion there is more or less disturbance of the nutrition and often some elevation of the temperature. The babies are almost always fussy and irritable and are troubled by flatulence and colic. Vomiting is also a not uncommon symptom. The character of the stools varies markedly, however, according to whether the baby is breast-fed or artificially fed and according to the cause of the disturbance of digestion.

When the diarrhea is due to an exces-

sive amount of or to too rich breast-milk, the stools are usually normal in color, but contain many fat curds and more or less mucus. The remedy, when the cause is too much breast-milk, is to shorten the duration of the nursings. The failure to empty the breasts will quickly diminish the supply of milk. When the breast-milk is too rich, the intervals between the nursings should be lengthened, as this procedure tends to diminish the amount of solids in the milk. The duration of the nursings should be shortened and water given at the time of the nursing to dilute the milk. A more simple diet and more exercise for the mother will usually bring down the strength of the milk to within normal limits.

There is nothing characteristic about the stools when the diarrhea is due to an excessive amount of or to too rich an artificial food. They may show evidences of the disturbance of the digestion of any or all of the food elements. Evidences of the disturbance of the digestion of fat are the most common. In beginning the treatment the intestines should be emptied with castor oil or milk of magnesia and all food stopped for from 12 to 24 hours. The baby should then be given small amounts of a dilute food for a time, after which the amount and strength of the food should be gradually raised to the baby's capacity.

Diarrhea from an excessive amount of fat in breast-milk is comparatively uncommon and the symptoms are usually not severe. The stools are nearly normal in color. They contain many small, soft curds and often mucus. Sometimes they have an oily appearance. They are more acid than normal and often cause irritation of the buttocks. It is usually not necessary to give a cathartic or to starve the baby. The duration of the nursings should be shortened temporarily and water given at the time of the nursings. Cutting down the amount of the mother's food as a whole, increasing the amount of exercise which she takes and getting her out of doors more will usually promptly bring down the percentage of fat to within normal limits.

Diarrhea from an excess of fat in an artificial food is not at all uncommon. When the disturbance is a mild one the stools are not much changed in color, but contain many small, soft curds and some mucus, and are somewhat more acid in odor and reaction than usual. Sometimes they are grey and shiny and in other instances, when there is an excess of neutral fat, they are creamy in consistency and color. Sometimes they look like curdled milk. In other instances they are bright yellow and have an oily appearance. They are seldom green, unless there is also a disturbance in the digestion of sugar. In the worst cases, they are watery, strongly acid and cause marked irritation of the buttocks. When this happens, the fat is in combination with the alkaline salts, especially sodium. As the result there is a considerable loss of alkaline salts in the stools. A relative acidosis is thus produced, with an excess of ammonia in the urine. The symptoms of acid intoxication may then develop. A high fever is not uncommon in these severe cases. The prognosis depends upon the severity of the symptoms, but is, in general, good, unless there is a marked acid intoxication.

The treatment consists in the complete elimination of fat from the food. It is not enough to diminish it; it must be cut out entirely. In most instances it is advisable to give a cathartic in the beginning and to starve for from 12 to 24 hours. In the cases with acid intoxication, bicarbonate of soda should be given in some way and a food containing considerable amounts of sugar, preferably in the form of glucose or maltose. In the less severe cases protein is usually well tolerated and the caloric value of the food, which is much reduced by the withdrawal of the fat, can be made up by increasing the amount of carbohydrates. Fat can usually be cautiously added again in a few days. How rapidly it can be added can only be determined by observation of the symptoms and examination of the stools.

Diarrhea from an excessive amount of sugar in breast-milk is very uncommon, and when it occurs is almost never very severe. The stools are loose, light green in color, acid in odor and reaction and irritating to the buttocks. If the mother has been taking a very large amount of sugar, cutting it down will probably reduce the percentage of sugar in her milk. If she

has not, the only way to reduce the amount of sugar in her milk is by cutting down her food as a whole and making her exercise and get out of doors more.

Diarrhea from an excess of carbohydrates in an artificial food may be caused by an excessive amount of any of the different forms of sugar or of starch. The symptoms vary somewhat according to which of the carbohydrates is the cause of the trouble. In general, the acute diarrheas from milk sugar and cane sugar are more serious and carry a more grave prognosis than do those from the maltose-dextrins preparations and starch. In most instances it is probable that the symptoms are in part due to the products of the fermentation of the carbohydrate at fault as the result of bacterial action. That is, the line between diarrhea from the disturbance of the digestion of carbohydrates and diarrhea with fermentation is very indefinite. A rise in temperature, sometimes considerable, is not uncommon and is likely to be most marked when the trouble is due to milk sugar or cane sugar.

When the diarrhea is due to an excess of milk sugar or cane sugar the stools are loose or watery, green, sour in odor, acid in reaction, and irritating to the buttocks. They often contain some mucus and not infrequently fat curds, the latter being due to the interference with absorption as the result of the speed with which the intestinal contents are carried through the bowels. The bowels should be cleaned out at once and food stopped for from 12 to 24 hours. All sugar should then be eliminated, as far as possible, from the food. Whey and whey mixtures are contraindicated, because whey contains from 4.50% to 5 % of milk sugar. Human milk is also contraindicated on account of the large amount of sugar which it contains. The percentage of fat must be kept low, because in these cases there is almost always a secondary disturbance of the digestion of fat. Protein is, therefore, the food element which is best borne. Starch may usually be given in small amounts, because, as it is slowly broken down and its end product, dextrose, quickly absorbed, there is never much sugar in the intestine at one time. Mixtures of skimmed milk with cereal diluents meet the indications in these cases very well. Albumen milk is also often useful. Foods of this character with very little fat and a minimum amount of sugar have relatively little caloric value. It is important, therefore, to add sugar to the food as soon as possible. The best form to use is one of the maltose-dextrins combinations, because the chemistry of the digestion and absorption of these forms of sugar is different from that of milk sugar and cane sugar. It is advisable, however, and in most instances possible, to change over to milk sugar after a short time.

When the diarrhea is due to one of the maltose-dextrins combinations the stools are loose and watery, strongly acid in reaction, and extremely irritating to the skin. The odor is peculiarly acrid, at times being that of butyric acid. The color is sometimes green, but more often brownish, the depth of the brown color depending upon the proportion of maltose in the sugar. The treatment of the diarrheas due to the maltose-dextrins preparations is along the same lines as when the trouble is caused by other sugars. There should be a preliminary catharsis and a period of starvation. The preparation at fault should be stopped entirely and a food low in fat and high in protein, with perhaps a little starch, given. Milk sugar should then be cautiously added to the food to bring up its caloric value. Whey and whey mixtures may be used in these cases, because they contain milk sugar. Albumen milk is also useful, but not if one of the maltose-dextrins mixtures is added to it, as is so often the case.

Acute diarrhea as the result of an excess of starch in the food is uncommon. If it occurs, the stools are usually somewhat brownish in color, although they may be green. They are sour in odor, acid in reaction, and irritating to the skin. They almost always show the iodin test for starch, either macroscopically or microscopically. The treatment, in addition to preliminary catharsis and starvation, consists in cutting out the starch from the food and giving one low in fat and sugar and high in protein.

Diarrhea is more often due to an excess of protein in human milk than to an excess of either fat or milk sugar. The protein

is most likely to be excessive in the early days of lactation and at the time of menstruation. An excess of protein may also be due to excitement, anxiety and nervousness, or to fatigue or lack of exercise. The diarrhea is usually not a serious one. The baby is ordinarily not very sick, and the temperature is but little, if at all, elevated. The stools are loose or watery, and often contain fat curds as the result of the increased peristalsis and the consequent interference with absorption. The stools are usually brownish-yellow in color, but may be green. They often contain mucus. The odor is not characteristic; the reaction is alkaline or feebly acid. They are not irritating to the skin.

In the severest cases it may be necessary to take the baby off the breast, after an initial catharsis and period of starvation. In most instances, however, it is sufficient to shorten the duration of the nursing periods and to give water at the time of the nursings, in order to diminish the percentage of protein by dilution, while the attempt is made to find and remove the cause of the excess. If this is due to excitement, anxiety or nervousness, their causes must be disposed of in some way. If it is due to fatigue or lack of exercise, the mother must be rested, or made to exercise, as the case may be. It is impossible to diminish the percentage of protein in the milk by any change in the diet without at the same time diminishing the percentages of the other food elements. They can, to a certain extent, be made to vary together, but the protein can not be made to vary alone.

Diarrhea from an excess of protein in an artificial food is quite uncommon. Casein curds are often found in the stools as the result of a disturbance of the digestion of casein, but they seldom cause or are accompanied by diarrhea. When the diarrhea is due to an excess of protein the stools are watery, brown, of a peculiar musty odor and alkaline in reaction. They do not, as a rule, irritate the buttocks. In this condition, the bowels should be thoroughly cleaned out and, after a short period of starvation, one of the cereal waters, to which milk sugar or one of the maltose-dextrins preparations has been added, given. Protein, preferably in the form of casein, must be added again as soon as possible in order to prevent too great protein waste.

### C. FERMENTATIVE DIARRHEA

Little is positively known as to the bacteriology of the intestinal tract in infancy under normal conditions; less is known about it under pathological conditions. It is believed that the bacterial flora depends to a considerable extent, both in health and disease, on the relation of the different food elements in the food to each other, although Sisson's recent work has thrown some doubt on this belief. If it is true that the bacterial flora varies in the relative proportions of the various organisms, even if not in their types, in accordance with the character of the food, it seems reasonable to suppose that the predominating forms may be modified or changed by changes in the food and that both normal and abnormal fermentative processes in the intestinal contents may be limited and altered in this way.

The term, "fermentative diarrhea," is used to designate a condition in which diarrhea results from fermentation in the intestines as the result of the abnormal growth and activity of micro-organisms in the intestinal contents. The term fermentation is used here in its broad sense and includes all the changes which take place in the various food elements as the result of the action of micro-organisms upon them. In some instances the micro-organisms concerned are the normal inhabitants of the intestinal tract; in others they do not belong to the normal intestinal flora.

It is extremely difficult to make a sharp distinction between diarrhea due to a chemical disturbance of the digestion and fermentative diarrhea, because there is unquestionably a certain amount of fermentation going on under normal conditions and more when there is a disturbance of the chemical processes of digestion. In diarrhea due to a chemical disturbance of the digestion, however, fermentation plays but a small part in either the pathology or symptomatology of the condition and none in the etiology. In fermentative diarrhea, fermentation plays the major part.

It is assumed that in fermentative diarrhea there are no pathological changes in the intestinal wall and that no bacteria enter into the general circulation. This is not strictly true, because in the more severe cases the intestines show the evidences of a mild catarrhal inflammation. In the most severe cases, however, there are marked clinical evidences of toxic absorption and the parenchymatous organs show the changes which result from the action of toxic substances.

Fermentative diarrhea is, in general, a more serious disease than diarrhea due to indigestion. The prognosis is especially grave when there are marked evidences of toxic absorption. The temperature is almost always elevated, often considerably, and the constitutional disturbances are marked. The character of the stools depends upon which of the food elements is being attacked by the micro-organisms which are the cause of the trouble in the individual instance. In most cases the disease is due to organisms which produce fermentative changes in carbohydrates and to a less extent in fat. Volatile fatty acids are formed from both the carbohydrates and fat, which cause increased peristalsis and watery stools. Owing to the nature of the fermentation, the stools are green, strongly acid in odor and reaction, and very irritating to the skin. They are often frothy, and often contain mucus as the result of the irritation of the intestinal mucosa by the acid intestinal contents. There is a considerable loss of alkaline salts in combination with the acids in the intestines, and in severe cases a relative acidosis is produced. When the disease is caused by the abnormal activity of proteolytic organisms the stools are more often yellow or yellowish brown than green, alkaline in reaction, and have a foul odor. They seldom contain curds, and mucus is a less prominent constituent. They seldom irritate the buttocks.

A thorough cleaning out of the intestines is extremely important in the beginning of the treatment of this type of diarrhea. So, also, is an initial period of starvation of from 24 to 48 hours, which seems better than anything else to diminish the number of bacteria in the intestines. Much liquid should be given during this period, however, either in the form of water or weak tea, sweetened with saccharin. The ideal treatment of this condition would be to destroy the bacteria which are causing the disturbance. This can not, unfortunately, be done by drugs, because none of the so-called intestinal antiseptics can be given in large enough doses to have any action on the pathogenic bacteria in the intestines without poisoning the baby. Furthermore, if they did have any action, it would be exerted on the antagonistic as well as on the pathogenic bacteria. It is possible, however, when the disease is caused by organisms of the gas bacillus type, by proteolytic bacteria, and perhaps by some other organisms, to inhibit or limit their growth by the administration of some form of lactic acid bacilli. These are best given in the form of buttermilk or modified milk "ripened" by them, because these milk preparations contain larger numbers of bacteria than do the small amounts of broth cultures usually given, and also because they contain lactic acid, which itself has an inhibitory action on the growth of these pathogenic organisms. It is self-evident that when lactic acid bacilli are the cause of the fermentation, foods containing these organisms should not be given.

The number of the pathogenic bacteria can also be diminished and their activity limited in fermentative diarrhea by a change in the character of the food. This results in a change in the character of the intestinal contents, that is, in the medium in which the pathogenic organisms are growing. If these are of the types which thrive on a carbohydrate medium, the percentage of the carbohydrates should be diminished and that of the protein increased. The percentage of fat should also be cut down, because when there is an abnormal fermentation of carbohydrates there is likely to be a secondary fermentation of the fat. If they are of the butyric acid type, the percentage of fat must be much diminished, that of the carbohydrates moderately diminished, and that of the protein much increased. When they are proteolytic in type, the percentage of the protein should be much diminished and that of carbohydrates materially increased. In certain instances it is possible to combine the treatment with lactic acid bacilli with that of change in diet.

Clinically, when the stools are loose, green, acid and irritating, the percentages of carbohydrates and fat should be cut down and that of the protein raised. It is in cases of this type that "albumen milk" works so well. Protein may also be given in the form of beef juice, broths and albumen water. Unless the fermentation is due to lactic acid bacteria, buttermilk and modified milks, low in fats and carbohydrates and high in protein, "ripened" with lactic acid organisms and unpasteurized, may be used. Breast milk is contraindicated. When the stools are brownish, alkaline and foul, the percentage of protein should be much reduced and that of the carbohydrates increased. The percentage of fat should also be cut down. Broths, beef juice, albumen water and "albumen milk" are contraindicated. Buttermilk, in spite of the large amount of protein which it contains, sometimes works well because of the lactic acid bacteria which it contains; so also does breast milk.

### D. INFECTIOUS DIARRHEA

The term, infectious diarrhea, is applied to conditions in which there is not only an infection of the intestinal contents, but also an invasion of the intestinal wall by pathogenic micro-organisms. These organisms in many instances pass through the intestinal wall into the circulation. It is evident that the line between fermentative diarrhea and infectious diarrhea can not be too sharply drawn. It is definite enough, however, to serve as a basis for classification and treatment. In one the seat of bacterial activity is primarily and almost exclusively in the intestinal contents, while in the other it is primarily in the intestinal wall itself. In one the causative micro-organisms are the secondary invaders of an abnormal intestinal content, while in the other they are the primary cause of the disease. In one the local lesions are insignificant; in the other they are marked.

The pathological lesions in infectious diarrhea are varied. There may be only a simple catarrhal inflammation or superficial ulceration of the intestinal mucosa. More often there is hyperplasia or deep ulceration of the solitary follicles and Peyer's patches, while not infrequently a pseudomembrane is formed over wide areas. There is also hyperplasia of the mesenteric lymph nodes and degeneration of the parenchymatous organs. The lesions are most marked in the large intestine and the lower portion of the ileum.

Infectious diarrhea is, as is evident from the pathological lesions, always a serious disease in infancy. The prognosis should always be a guarded one, even if at first the symptoms do not seem especially severe, because it is impossible to tell in the beginning what course the disease will take. The symptoms correspond to the pathological lesions. The stools are frequent, small, and composed mostly of mucus and blood, with but little fecal matter. After a few days they often contain pus and not infrequently membrane. When the stools are composed mostly of mucus and blood, they usually have but little odor, but sometimes it is much like that of wet hay. When they contain much pus or membrane, as the result of deep ulcerative or gangrenous processes in the intestine, the odor is putrefactive or gangrenous. The reaction is usually alkaline. Pain in the abdomen and tenesmus are marked. Vomiting is infrequent. The abdomen is usually sunken. The temperature is always elevated, but is usually not very high. The blood shows a polyneuclear leucocytosis, and the urine the evidences of acute degeneration of the kidneys.

Infectious diarrhea may be caused by micro-organisms of several different types. Barring the amoeba coli, which, at any rate in the Northern states, is seldom responsible, they may be roughly divided into three main classes:

a. The dysentery bacillus in all its forms;
b. The gas bacillus and similar organisms; and
c. Other organisms, of which the most important are the streptococcus, the colon bacillus and the bacillus pyocyaneus.

The symptoms produced by these different types of organisms are frequently identical, and it is usually impossible to determine from them which type of organism is the cause of the disease. Certain observers have recently questioned the etiological relation of the gas bacillus

to infectious diarrhea, and claim that it is always due to the dysentery bacillus. The bacteriological findings in the stools by other equally or more competent observers and the good results of treatment based on a varied etiology seem to be sufficient, however, to prove that infectious diarrhea may be caused by a number of organisms of different types.

The first thing to be done in the treatment of infectious diarrhea is to thoroughly clean out the intestinal tract. All food should be stopped for from 12 to 24 hours, water or weak tea, sweetened with saccharin, if necessary, being given freely during this time.

The most important element in the treatment of infectious diarrhea is the diet. The character of the diet depends upon the variety of the micro-organism which is causing the disease. These micro-organisms can be divided, as far as the determination of the diet to be used is concerned, into two groups:

1. The various forms of the dysentery bacillus and the other organisms, except the gas bicillus, which cause the disease.
2. The gas bacillus and allied organisms.

The other organisms, although of many different varieties, are grouped with the dysentery bacilli, because as regards their growth and the production of toxic substances from protein and carbohydrate media, they behave in the same way.

The dysentery bacillus, the colon bacillus and the streptococcus belong to the class of facultative bacteria. This class of organisms can thrive upon either carbohydrate or protein media. They produce harmless products from carbohydrates and toxic substances from protein. They act upon and use up the carbohydrate material before they attack the protein, when both are present in the medium in which they are growing. The products of the breaking down of the carbohydrate material have, moreover, when produced in sufficient amounts, an inhibitory action on the development of dysentery bacilli and, to a less extent, of streptococci.

It is evident, therefore, that when infectious diarrhea is caused by bacteria of this type, the food should be largely carbohydrate in character. In this way the organisms are prevented from forming toxic substances and their growth is, to a certain extent, inhibited. The prolonged withdrawal of food is also contraindicated, because the intestinal contents are then made up entirely of the intestinal secretions, which are protein in character. Some form of carbohydrate should, therefore, be given after a few hours. Milk sugar is the most suitable, because, being more slowly broken down and absorbed than the other sugars, it provides a carbohydrate medium in the intestines for a longer time. It should be given frequently in small amounts, in the form of a 5 % or 7 % solution in water, in order that a continuous supply may be brought to the intestines. It is advisable after one or two days to give the milk sugar in barley water, containing from 0.75 % to 1 % of starch. The starch provides more nourishment and being still more slowly broken down and absorbed, favors still further the prolonged continuance of a carbohydrate medium in the intestines. Boiled skimmed milk should be added cautiously to the food as soon as improvement begins, in order to prevent too great protein waste of the organism. Care must be taken, however, not to give enough to neutralize the action of the carbohydrates. Intravenous injections of a 2.5 % solution of Kahlbaum's dextrose in physiological salt solution may be used in severe cases to furnish a carbohydrate instead of a protein medium for the bacteria which have entered the circulation to grow in and also to supply an immediately utilizable source of energy and to spare the body protein. Irrigation of the colon with solutions of lactose or dextrose, while theoretically indicated, is of little practical value.

The gas bacillus and allied organisms grow rapidly in the intestinal tract when there is an excess of utilizable carbohydrate in the bowel and at the same time an insufficient number of those organisms which form lactic acid from carbohydrates to produce enough lactic acid to inhibit their growth, the gas bacillus being sensitive to lactic acid. The indications to be followed in the treatment of cases of infectious diarrhea caused by the gas bacillus are, therefore, to cut down the carbohydrates in the diet and to introduce lactic acid producing bacteria into the intestines.

These indications can best be met by the use of unheated buttermilk or, better, of mixtures containing no fat, 3 % or 4 % of milk sugar and from 1.50 % to 2.50 % of protein "ripened" with lactic acid forming organisms. It is not possible to cut out the sugar entirely, because, if this is done, the lactic acid forming organisms will have nothing on which to grow. The lactic acid already present in the food exerts an immediately inhibitory action upon the gas bacillus, while the lactic acid forming organisms in it, by keeping up the production of lactic acid, continue this action. They also use up the available supply of carbohydrate and thus interfere with the growth of the gas bacillus.

Cutting down the carbohydrates in the diet and increasing the amount of protein in it is sufficient to relieve the condition in mild cases. The percentage of fat should also be kept low. Mixtures containing from 1 % to 1.50 % of fat and from 1.50 % to 3 % of protein, with no more milk sugar than is necessarily added in the milk and cream to give the desired percentages of fat and protein, are suitable ones. It is well to boil them in order to prevent the formation of casein curds.

It is evident that the line of diet which is suitable for one type of infectious diarrhea is not only not suitable, but absolutely harmful, for the other, and vice versa. It is extremely important, therefore, not to make a mistake in the choice. It is unfortunately almost impossible for the practitioner without special bacteriological training and a laboratory at his command to determine at once what form of micro-organism is the cause in the individual case. It is not unlikely, however, that the cases due to the dysentery bacillus may soon be recognizable immediately by skin tests. The presence or absence of the gas bacillus can, moreover, be determined by any one in twenty-four hours by a simple fermentation test.*

A point which is of some assistance in arriving at a tentative conclusion is that in a given season the vast majority of the cases of infectious diarrhea are due to the same organism. If the prevailing organism is known, the chances are, therefore, that this organism is also the cause in a given case. Another method of determining the case, a method which is most unscientific, but nevertheless often the only practicable one, is to give what seems to be the most rational diet and then observe the results. If the temperature begins to come down and the patient improves, it is almost certain that the organism causing the disease is of the type for which that form of dietetic treatment is indicated. If, on the other hand, the temperature remains elevated or rises and there is no improvement in the other symptoms, it is evident that the causative organism belongs to the other type and that the diet must be changed.

Irrigation of the bowels with physiological salt solution or a 1 % solution of boracic acid once or twice in the twenty-four hours in order to cleanse the colon is a useful procedure. If it depresses or disturbs the baby materially, it should be given up, as under these circumstances it does more harm than good. In sub-acute cases or in those in which the stools fail to clear up after a reasonable time, injections of from 6 to 16 ounces of a 2 % or 3 % solution of nitrate of silver every other day are often useful. The so-called intestinal antiseptics are of little or no value, because it is impossible to give them in large enough doses to have any effect on the pathogenic bacteria in the intestines without poisoning the baby. Furthermore, if they had any action, it would be exerted on the antagonistic as well as on the pathogenic bacteria.

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*Sylvester and Hibben: Archives of Pediatrics. 1915, XXXII, 457.

1. Fill fermentation tube and large test tube with concentrated nitric acid. (This destroys all organisms and spores.)
2. Pour off acid after three minutes and rinse with hot tap water until neutral to litmus.
3. With a glass spatula (soaked in acid and washed until neutral) place about 1 c. c. of dextrimaltose and 1 c. c. of stool in one-third test tube of water. (If the stool is solid, it must be finely divided in water.)
4. Boil vigorously one-half minute and put into fermentation tube, tilting back and forth to eliminate bubbles.
5. Stopper tube with flamed cotton and place in incubator at 37° C. for 24 hours.
6. After 24 hours inspect tube for gas and note amount. If no gas is formed or the bubble is not larger than a pinhead, the result is negative. If there is less than ½ inch of gas, the result is questionable. If there is ½ inch or more of gas, the result is positive.

This is neither the time nor the place to take up in detail the treatment of symptoms or of complications, although much can be done in this way, not only to relieve suffering, but also to preserve life. It is sufficient to have classified these acute diarrheal diseases of infancy in a general way and to have considered the main principles of treatment.

## DISCUSSION

*Dr. William A. Mulherin, Augusta, Ga.*—I was very much interested to learn that Dr. Morse still adheres to his belief that there exists in the stools of infants and children suffering from infectious diarrhea a gas-forming organism, or a non-gas-forming organism. Personally, up 'till recently, I have had all stools cultured in my private practice and likewise all diarrheal cases in the Children's Hospital at Augusta, Ga., and have regulated the diet in accordance with the findings. My results were most gratifying, and it appeared to me that my mortality was somewhat lower. Recently, learning that a number of pediatrists were not culturing the stools of their little patients, and after reading the results of Dr. Sisson's experiments conducted at the Johns Hopkins bacteriological laboratory showing that he was unable to find that the gas- and non-gas-forming organisms in the bowels were affected by diet, I have not been so particular about culturing the stools as I was formerly.

Accepting the Chairman's invitation to ask questions, and fully realizing that there are two sides to every question, with all due respect to the essayist, our guest, and merely with a desire for information, I shall thank Dr. Morse if he will give his views as regards the value of Dr. Sisson's findings, which, as I understand, are directly opposed to his theory and practice in infectious diarrhea.

*A Member.*—I should like to ask Dr. Morse to give the skin test for the infectious form of diarrhea.

*Dr. L. W. Elias, Asheville, N. C.*—I should like to ask Dr. Morse about the injection of silver nitrate, the 3 % solution. I believe he said a pint. I had one case in which I used this, and the child suffered so from it that I have never repeated it. I should like to know how it is given without discomfort to the child. The tenesmus that followed in my case was terrific.

*Dr. Morse (closing).*—It is often hard to know what to think about the results of the bacteriological studies of the intestinal flora. As far as I can see, the results of different men are absolutely contradictory; and apparently, as far as I can see, first-class men, who ought to be equally good observers, and ought to be equally careful, differ greatly.

With regard to the work on the gas bacillus and infectious diarrhea, much of this work has been done at the Floating Hospital. Dr. Kendall, who was with Dr. Herter for many years, and is now in Chicago, believes that the gas bacillus plays an important part in the etiology of certain epidemics. He was followed by Ten Broeck, also a first-class man, who says that it has nothing to do with this condition. It is the same way with fermental conditions. Dr. Sylvester and the men working with him say that it causes fermentation in the intestinal contents. Others say that the gas bacillus is a normal inhabitant of the intestinal contents and causes no trouble. It is said by some that starvation diminishes the intestinal fermentation, while others say that it increases it. A man who is not a bacteriologist is hardly able to decide. You must either leave it out of consideration or follow the man in whom you have the greatest confidence, the man whose conclusions seem to be most warranted from your clinical results. I should not be surprised, if I live ten years more, to have an entirely different view, provided the war does not last so long as that.

In regard to the skin test for infectious diarrhea, at the Floating Hospital, summer before last, a good deal of work was done by Dr. Baker with the ordinary anaphylactic skin test. He was able to tell, within a few hours, whether the diarrhea was due to dysentery bacilli or not.

As to the injection of nitrate of silver, I have seen these injections given, and have not seen any severe reactions. We wash out the bowel and then give the silver injection. If there is any complaint, we give an injection of salt and water, which stops the trouble right off. It is seldom, however, that this is necessary.

## ECZEMA IN INFANCY*

By F. P. Gengenbach, M.D.,
Denver, Colo.

In looking over the recent literature on eczema one is impressed with two new phases of the subject: first, the discussion as to whether eczema and dermatitis are similar skin manifestations; and second, the efforts to discover the etiology of eczema in food sensitization.

A prolonged discussion of the entity of eczema and dermatitis is not within the scope of this paper. Suffice it to say that the writer agrees with Pusey in his text book (Dermatology) when he says:[1]

"Leaving out these unessential qualifications, we can not avoid the position that eczema is dermatitis; and, as far as the lesions in the skin are concerned, this statement represents the fact."

Heimann[2] says:

"Eczema and simple dermatitis resemble each other clinically and microscopically. Thus eczema, from the standpoint of pathology, is dermatitis, differing from the latter in the clinical sense

*Read in Section on Pediatrics, Southern Medical Association, Eleventh Annual Meeting, Memphis, Tenn., Nov. 12-15, 1917.

only in so far as it arises without a demonstrable local cause." "Processes which are alike clinically, histologically, histogenetically and pathogenically are identical; wherefore, all that remains of eczema is the fact that it is dermatitis of unknown origin."

Crary[3] in his recent article says:

"In children two years of age, or less, an eczema of extensive distribution, of purely external origin, is rare, though in perhaps nearly all, if not indeed all, the external cause is present as the determining cause; the predisposition to the outbreak being established by causes of internal origin."

He then calls attention to the work on food anaphylaxis done by Strichler and Goldberg,[4] McBride and Schorer,[5] and White.[6]

White in turn in his article calls attention to the work done in infantile eczema by Schloss[7] and Towle and Talbot.[8] White also calls attention to the value of routine stool examinations in cases of eczema, and summarizes his work by saying:

"From the detailed results it is evident that a goodly proportion of persons affected with chronic eczema show sensitization to the various types of food and that a much larger percentage are unable wholly to digest all the elements of the foods they eat." "I can not present exact figures showing the comparative percentage of improvement or cures resulting from the correction of errors of diet in these eczematous patients as revealed by these two methods of examination—I can merely assert that chronic eczema should no longer be the bugbear that it was; in fact, with the aid of these two methods, one should expect to cure and cure reasonably quickly the great majority of these patients who present themselves for treatment. I believe that this assertion could not have been made with equal truth two years ago."

The following is White's own description of his method of making food inoculations:

"In a certain number the skin was delicately broken by the rotation of a dental burr, while in others an exceedingly superficial incision was made with a clean sharp scalpel. The latter method was finally adopted because it produced less artificial disturbance in the controls of the factitiously urticarial subjects. The flexor surface of the arm of the affected individual was cleaned, two parallel rows of four or more incisions were made, and on four of the incisions were placed a drop of cow's fat-free milk, a drop of oatmeal water or of lactose, a small piece of salt-free butter, and a drop of egg albumin. (At times more detailed tests of many substances were made.) The other four incisions or abrasions were untouched and left as controls. A positive reaction consists in the reddening and infiltration and, in rarer instances, of papulation of the skin. If the control incision manifests the same reaction, the test is not considered positive."

Judging from his own personal experience the writer believes that, at least as far as milk is concerned, the offending food elements are fat, protein and carbohydrates in the order named. Practically every case of infantile eczema is improved by the reduction of the fat in the food, but it is usually not advisable, and seldom necessary, to reduce the protein intake below the normal requirement. Many cases are benefited by reducing the percentage of sugar, or replacing milk or cane sugar, with maltose and dextrose.

There are, however, a large number of other exciting factors which have been pointed out, such as excess of salt in the food; lack of thyroid secretion; highly acid urine; adherent prepuce in male infants and why not in female infants also; irritating clothing such as wearing wool next to the skin; irritation from the ordinary soap and water bath; exposure to inclement weather; reflex nervous causes, such as dentition, and direct external causes such as scratching and the presence of parasites.

While in Berlin the writer saw a marked case of infantile eczema in Finkelstein's clinic apparently cured without external applications by removing the salt from the milk, only to reappear when salt was again added to the food.

Herbert[9] says: "The study of the feces and the cutaneous food inoculations are helpful in finding the cause. When there is neither an excess of fat or of starch in the feces, try the cutaneous inoculations of the various food substances. If no cause is found, think of a diminished thyroid secretion." The writer has seen a number of cases of infantile eczema apparently decidedly benefited by the administration of small doses of thyroid extract giving ¼ to ½ grain twice a day.

Highly acid urine is so frequently a cause of intertrigo that a neutralization of the urine, by increasing the water intake and the administration of the citrate of soda or potash, is always advisable.

Dyer several years ago called attention to a form of eczema associated with prepucial adhesions in male infants relieved by circumcision.

There are so many individuals who are unable to wear wool next to the skin that

the writer advises the use of thin cotton garments under the woolen ones commonly worn by children. This includes cotton stockings as well as underwear.

It is hardly necessary to call attention to the irritation caused by the use of soap and water in cases of eczema. For ordinary cleansing olive oil applied with a soft cloth is sufficient, while where a bath becomes advisable the use of bran and magnesium sulphate and perhaps the addition of a very small percentage of phenol, lysol or creolin in the water reduces the irritation to a minimum.

Have you never noticed how a case of eczema is aggravated when an infant is taken outdoors in windy or stormy weather? Many cases develop as a so-called winter eczema from exposure to inclement weather.

In following cases of eczema one almost always notices an increase in the skin manifestations whenever a tooth is about to erupt; while the same is true whenever the infant succeeds in scratching itself, or where it is suffering from a parasitic skin disease.

Eczema may, for the sake of convenience, be divided into the moist or acute type, and the dry or chronic type. The division into the erythematous, papular, vesicular, pustular, etc., types may well be ignored as they usually represent different stages of the same process. The same may be said of the division into acute, subacute and chronic.

Since the diagnosis of eczema is usually easy, the relief and cure of the skin manifestations becomes the principal desideratum. One should, however, be able to differentiate the sypholides, tuberculids and the eruptions caused by scratching in parasitic skin diseases, for here the foundation for the cure must lie in the relief of the underlying condition.

The treatment of eczema may readily be divided into general and local. Under the head of general treatment comes attention to general hygienic measures, including increased elimination from the bowels, kidneys and skin, proper nourishment, and the relief of reflex conditions like hypothyroidea, uric acid diathesis, difficult dentition, and phimosis. It is generally conceded that auto-intoxication due to faulty elimination is one of the important factors in the causation of eczema. A thorough cleaning out of the gastro-intestinal tract, with increased water intake, will frequently be sufficient to cause an immediate improvement in the eruption. For this purpose nothing is better than a preliminary intestinal irrigation, then a course of mild chlorid of mercury, followed by castor oil, milk of magnesia or sodium phosphate.

Under proper nourishment comes regulation of the diet, preferably after efforts have been made to discover the offending food elements by examination of the stools and food inoculations of the skin.

The regulation of food is usually much easier in artificially fed infants than in the-breast fed. In breast-fed infants fat is practically always the offending element. The mother should take less of the fat-producing foods, especially red meats, rich milk or cream, eggs, and malt preparations, especially alcoholic beverages. She should drink more water and take more exercise, especially outdoors. The nursing interval should be lengthened and the nursing time should be curtailed so the infant will only get the first part of the nurse, which is always the lowest in fat. The remainder of the milk should be pumped out or nursed out by another healthy nonsusceptible infant in order to prevent caking of the breasts. If necessary the infant should receive before nursing one-half to one ounce of boiled water or weak cereal water to which has been added two to five grains of sodium citrate. If the infant is constipated it should be given milk of magnesia or sodium phosphate, while if the mother is constipated she should be encouraged to drink plenty of water and to eat plenty of the sub-acid fruits, vegetables, bran preparations, and if necessary take some mild laxative like mineral oil, cascara, mild aperient waters, compound licorice powder, or one of the many mild laxative pills.

While these measures in conjunction with local applications will not always cure the eruption, yet there is usually sufficient improvement that one must bear in mind Kerley's admonition that "if the child is thriving, making a satisfactory gain in weight, the nursing should never be discontinued because of the eczema."

In artificially-fed infants the writer first warns the mother that in order to bring about a rapid improvement in the eruption it will be necessary so to weaken the food that the baby will probably lose or stand still in weight for a time.

It is my practice to give these infants boiled skimmed milk diluted with plain boiled water to which has been added sodium citrate. If sweetening of the food is necessary such as when the baby has been on condensed milk, a small amount of saccharin is added. This immediately places the infant upon a food low in fat and sugar, and with the proteid so modified as to be easily digestible. Then if possible the dilution is gradually decreased until the infant is taking the boiled skimmed milk alone. This tests out the tolerance for proteid.

At the same time orange juice is also tried about half an hour before one or more feedings, the latter being given at three-hour intervals.

If the skin manifestations have practically, if not wholly, cleared up, a gradually increasing amount of cream is left on the milk until if possible whole milk is given. Should, however, this cause an aggravation of the skin symptoms, the fat percentage is again reduced to the point of tolerance, and the addition of carbohydrate in the form of cereal or sugar, especially maltose and dextrose, is cautiously tried.

If the infant has passed the first half year of life vegetable broths, made with little or no meat stock, are next tried, followed later by the vegetables themselves put through a strainer or the ricer. The best vegetables for this purpose are potatoes, carrots, spinach, turnips and squash. Strained stewed fruits are also tried, especially if the child is constipated. Various cereals are also tried and soft puddings like gelatine, tapioca, corn starch and custards, if no sensitization to eggs exist.

In order to help the teeth through the baby is given zwieback, whole wheat sticks or well toasted whole wheat bread to chew upon. During the second year beef juice, scraped meat or meat broths and eggs may be given, but these cases usually do better on practically a meat-free diet and the use of eggs sparingly. Thoroughly cooked rice, farina and hominy grits usually agree well. If the digestion of infant is good more stress is laid on the solid foods and less on the milk, the solid foods always being given first.

In artificially-fed infants, as in the breast-fed, one must, however, never for the sake of the eczema sacrifice the future of the child by interfering for a long time with the normal food requirement.

As Hubert puts it, "Proper growth and development are more important than a slight degree of eczema." One other warning: in some infants, those of the exudative diatheses type of Czerny, the clearing up of the skin manifestations seems to predispose them to bronchial catarrh and diarrhea, and in later years asthma and recurrent vomiting. Here again a slight degree of eczema is the lesser evil.

In poorly nourished infants tonics are often helpful; of these syrup of iron iodid, amorphous phosphorus or the hypophosphites and cod liver oil with malt have proven the best. Arsenic should only be given in the chronic dry types, and then only in small doses.

In malarial districts some of the palatable quinin preparations like euquinin or coca and quinin may be tried.

Under local treatment comes the removal of all external irritants and the use of local applications for the relief and cure of the skin manifestations.

Special efforts should be made to protect the skin from irritating underwear, exposure to inclement weather, and irritating discharges from the urinary and intestinal tracts. As the itching is always worse when the child becomes overheated, care should be taken not to dress the child too warmly, nor to use too many bed covers when asleep.

So many local applications have been suggested for eczema and prescriptions for the same are so readily found in the text books that it would unduly prolong this paper to attempt to discuss them. Suffice it to say that in the acute cases one should use mild sedative applications, and in the chronic cases more stimulating ones. It is always safer to err on the side of making the local applications too weak rather than too stimulating, remembering that the application that relieves one case may cause

considerable irritation in another case.

In acute cases moist applications are sometimes preferable to ointments, but may cause depression by too rapid chilling of the surface of the body. In any extensive case, as in extensive burn cases, one must not use any ingredient which might prove toxic by absorption through the skin. This is particularly true of phenol, which has marked antipruritic properties, but should only be used in the strength of ¼ to 1 %. One of the best of the moist applications is the calamine lotion suggested by Markley, the formula of which is as follows:

| | |
|---|---|
| Calamine (pink) | grains lxxx |
| Zinc. oxid. (Hubbard's) | ounces iv |
| Glycerine | ounces i |
| Aq. calcis q. s. ad | ounces viii |

Where the itching is marked phenol may be added in the percentages suggested above or a weak solution of liquor carbonis detergens, about a dram to 4 or 6 ounces of distilled water, may be tried.

In subacute or chronic cases, also in seborrhea of the scalp, where crust formation is marked, the crusts should first be softened down with olive oil and removed and the hair clipped short. For these cases the following ointment has served me well:

| | |
|---|---|
| Acid salicylic | grains viii |
| Acid boric | drachms ss |
| Ung. zinci oxid | drachms iv |
| Phenolated vaseline, q. s. ad | ounces i |

Where increased stimulation seems indicated sulphur or one of the preparations of tar may be added. To prevent scratching it may be necessary to splint the arms or tie the child down while in bed.

## SUMMARY

Eczema is a dermatitis due to many internal and external causes, some of which are still unknown and are included in the broad term predisposition.

The principal internal cause, aside from the so-called predisposition, is a food intoxication or sensitization, usually combined with faulty elimination.

The external causes include all forms of irritation whether mechanical, chemical or bacterial.

The treatment consists of the discovery and removal of the cause or causes and the relief of the symptoms.

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## DISCUSSION

*Dr. P. F. Barbour, Louisville, Ky.*—I am struck with the idea that a paper of this kind, presented before this Section, will bring out one phase of eczema; while the same subject, presented before the Section on Dermatology, would receive an entirely different if not a contradictory type of treatment. With the dermatologists in my home city I have a constant quarrel as to whether eczema is a pediatric or a dermatologic disease. Certainly, in a child, it seems to me that, as Dr. Gengenbach has brought out, it is frequently a disorder of nutrition or is dependent on the food. It seems to me that, so far as we are concerned, this should clinch the argument.

I think that almost every kind of paste ever recommended has been used in cases of eczema without benefit, until the child was treated from a systematic standpoint. One thing that should be remembered is that the skins of normal children are of various kinds. I have no doubt that each and every one of us who goes through the shaving process experiences varying degrees of discomfort. Some can be shaved with impunity and others break out with an eruption. Some children have skins that are more sensitive than those of others and the least irritant produces an eczema in them.

The cases occur mostly in young children, even in breast-fed children; and I have stated to the mother in every instance, "this is a case of overfeeding." I agree with the remarks of Dr. Love and Dr. Morse on the grandmother. I suppose that every child with one has more to eat than is good for it. Starvation has a better effect in some cases than active medication.

I have looked to the mothers' milk for the causative principle that produces an eczema, because I have found that breast-fed children showed evidence of an ammoniacal irritation and inability to handle foods. I wish also to call attention to one fact, and that is that while the child may be a fresh, florid-appearing child, he is not in the robust health he seems to present. If you follow the history of these eczematous children, you find that they are often the subjects of asthma. That is one of the things that leads us to believe that food intolerance is the cause of the eczema. There are many that, particularly in the adult life, are prone to rheumatic disease, so I believe that they require not only

treatment in the individual case, but more careful handling than healthy children in order to attain to healthy adult life.

*Dr. L. W. Elias, Asheville, N. C.*—This paper of Dr. Gengenbach's, it seems to me, has about covered the subject of the disease. It is one of the most annoying conditions that we have to contend with, not to be a fatal disease. There is no place where the doctor has to contend more with patent salves and ointments than in the treatment of eczema; because, with your best efforts, you may reduce the trouble, but it is a tedious thing to cure. Some one comes and suggests an ointment, and the drug store is treating the case instead of you. If you have it reduced it does not stay that way; so the case passes from your hands. The treatment that you prescribe is tedious and after a while it falls into disuse.

One of the most important things in the beginning is to try to secure the co-operation and confidence of the parents in the treatment of this disease, so that they will let you work out the thing with fear and trembling. Most of the cases are in fat babies, but there is a class of cases in which you have to neglect the eczema to a very large extent. That is in babies that are thriving poorly, difficult feeding cases, in which you have difficulty in nourishing the baby properly with any means. You usually have to give in to the eczema to a certain extent in such cases.

One point that should be mentioned, and one which Dr. Gengenbach did not mention, is the restraining of the baby from scratching by putting things on its hands. This keeps it from rubbing the inflamed tissue. That, in addition to what he has said, covers the ground.

*Dr. Frank C. Neff, Kansas City, Mo.*—A few years ago eczema was considered to be a skin disease, and was so treated. The most wonderful advance has been made in the work of recent years in determining that it is not always due to the same cause, and what the various causes are. As Dr. Barbour says, a great many of these cases that one sees early are found in breast-fed children; and these are due solely to excessive feeding. If some have the exudative diathesis or latent tuberculous infection is a thing that should be determined. Certain it is that there is nothing more disappointing than the treatment of eczema in a local way, uncoupled with changes in the feeding. Blackfan, of Johns Hopkins, brought out something useful a year or so ago in the treatment of eczema. It is only available, however, in babies that have reached the age of six months or more, when milk can be eliminated from the diet for a short time. That is, the use of butter and oatmeal. I have tried it in a number of cases and there has been a remarkable subsidence of the dermatitis within a day or two. Of course it returns, unless one can adapt the diet to the child's needs.

When it is due to sensitization to certain proteins we may find, if the eczema has existed for any length of time, that there is sensitization to more than one protein. This makes it difficult to and almost impossible to cure an eczema if milk products have to be left out of the diet for any length of time.

*Dr. Morgan Smith, Little Rock, Ark.*—It is not always easy to find the cause of eczema in children. A case that came under my observation recently, however, showed the role which an exclusive carbohydrate diet plays in causing water-logging and eczema. A breast-fed infant was referred to me with a diagnosis of acute Bright's disease. It was breast-fed until three months of age, when it was put on an exclusive diet of rice gruel. At the time of examination, it was five months old and weighed 11½ pounds. Because of the universal edema and generalized eczema, the infant looked more like a monstrosity than a human. For two months its diet consisted exclusively of four tablespoonfuls of rice, cooked in 20 oz. of water, which amount was fed every twenty-four hours. This gruel was fed exclusively for six weeks, when it developed a generalized edema and eczema. It was water-logged to an extreme degree. Its rice gruel was discontinued and was put on a 2:1:1 milk mixture. Within two months the weight had decreased from 11½ pounds to 8½ pounds when, upon a gradual increase of the fat, carbohydrate and protein, it began to increase in weight and was dismissed cured. The infant received no special treatment for its eczematous condition.

*Dr. Oliver W. Hill, Knoxville, Tenn.*—We have neglected eczema. We do not know much about it. I am convinced that it is due to food intolerance. As to Blackfan's experiments with butter and oatmeal, I can not say that I have had any good results from their use. I have seen children with food intolerance for oatmeal and we also find children who have food intolerance for butter. Some one said that dermatologists say that sulphur inside or outside is always indicated in skin diseases. I have found that bitartrate of potash and sulphur in the beginning relieves the patient temporarily while one is working the food up. I give you that as a tip, for what it is worth.

Eczema fascinates me; working out the diet is beautiful and interesting. A case that came to me from another state was a pure luetic eczema and had been treated as a case of food eczema. It gave a positive Wassermann as well as luetin, and recovered on antisyphilitic treatment very promptly.

The majority of food eczemas are due to sugar intolerance. I do not remember to have encountered any due to intolerance for protein. If I eliminate carbohydrates and lower fats the case usually clears up and I gradually increase the food elements to normal.

*Dr. N. C. Womack, Jackson, Miss.*—I am disappointed that in the discussion of this paper more men have not mentioned the point that Dr. Barbour brought out. There are others. As Dr. Gengenbach pointed out so admirably in his paper, there are other neuroses. The dermatitis, the rash, is simply the annoying symptom of the eczema, which is a food intolerance. If we all remember the cases that we used to treat before we knew about food intolerance, we find that these children were susceptible to asthmatic conditions. I remember a case in an infant three months of

age, with bad eczema, which cleared up; but at the age of fifteen or sixteen years the patient developed a peculiar condition. I was summoned to the house on three occasions for spells of a condition that I thought to be acidosis. Later, it proved to be an asthmatic condition. The child possessed an intolerance for egg albumin. By the way, this child's mother had a fever, which she discovered to be the "rose fever."

*A Member.*—The more I read of and hear discussed these diseases that are under discussion now, the more I become convinced of the wisdom of the old Chinese saying of salutation when people meet, "How are your bowels?"—taking it for granted that if the bowels are all right the individual is also. When we take into consideration the fact that the diet is the important thing in the treatment, we shall have more satisfactory results.

*Dr. Gengenbach (closing).*—There is one phase of the subject that I did not touch upon that I might speak of here, because it may come to the attention of some of the members.

There is an idea prevalent that in some cases of eczema you may get sudden death through the treatment of the same. Perhaps I touched on that matter by saying that there are certain cases in which, apparently, your efforts to control the skin manifestations seem to bring about manifestations somewhere else in the body, in the form of bronchial catarrh, diarrhea, asthma and recurrent vomiting, which might prove fatal. However, there have been some cases of sudden death reported in eczema, supposed to be due to over-treatment. In most cases, if the opportunity for a post-mortem had been allowed, they probably would have been found to be cases of thymus enlargement.

Dr. Barbour asked me in the other room whether any tests were made in the mother for syphilis. So far as I know, no such tests have been made. They should be carried out when indicated.

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# DISCUSSION OF THE PRACTICAL VALUE OF A ROUTINE EXAMINATION OF THE BLOOD, SPINAL FLUID AND URINE IN PEDIATRIC PRACTICE*

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A discussion of the practical value of a routine examination of the blood, spinal fluid and urine embraces to a large extent the laboratory side of pediatrics. The vital importance and relationship existing between the laboratory examinations and the successful practice of pediatrics is too well known to all physicians, and especially to pediatrists, to require any elaborate arguments for substantiation.

The laboratory and clinical sides in pediatrics are so closely united that one can not properly exist without the other; both are integral parts of the same unit, which unit stands for the logical, scientific and successful practice of pediatrics.

The subject is a broad one, and the time allotted for the reading of this paper is short. The purpose, therefore, of my paper will be to endeavor to emphasize the importance of some of the chief laboratory examinations in diseases affecting the blood, spinal fluid and urine. Their practical value, I believe, can be demonstrated best and more thoroughly appreciated by studying the laboratory findings in these diseases.

## BLOOD

It is necessary for the proper interpretation of blood findings in pediatric practice to understand thoroughly the normal differences existing in the blood of infancy and the blood of adults.

*Hemoglobin in Infancy.*—The percentage in the first three or four days of life is 100 to 125 %. It then gradually drops to about 60 % at three weeks of age. It rises to about 70 % at six months, at which point it remains steadily until baby reaches two years of age. From two years of age it slowly increases and reaches the adult type at about six or seven years of age. The percentage runs a little higher in boys than in girls. It is well to remember that infancy carries a relatively low hemoglobin percentage, otherwise we will be diagnosing anemia in our little patients when no such condition exists.

*Red Blood Corpuscles.*—In the first three or four days of life the red blood cells average, per cubic mm., 6,000,000 to 7,500,000. They diminish in number to 5,500,000 to 6,000,000 at 2 to 3 weeks of age, and this number remains as the normal count throughout infancy (first two years of life). The red blood cells gradually grow less in number from two years, until they

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reach the normal adult count of 5,000,000 per cubic mm., at six or seven years of age. An important point to be borne in mind is that the red blood cells in infancy have a strong tendency to revert back to the embryonic or fetal type. This is manifested by a variation in the size and shape, and also in the neucleation of red cells for much less provocation than would be necessary in the adult. A diagnosis of pernicious anemia, therefore, should not be made, when only a severe type of secondary anemia is present, as shown by numerous megaloblasts and normoblasts.

*White Cells.*—There exists in the first few days of life a leucocyte count of about 20,000 to 30,000. In a few days the count drops to 12,000 to 14,000, where it remains until baby is six months of age. From six months to two years, the average amount is 10,000 to 12,000. After two years the count is the same as that of the adult. The normal differential count for infancy, according to Morse, is roughly as follows:

| | % |
|---|---|
| Small mononuclears | 40 to 50 |
| Large mononuclear or transitional forms | 10 |
| Polymorphonuclear neutrophiles | 35 to 45 |
| Eosinophiles | 1 to 5 |
| Mast cells | 1 |

After two years the polymorphonuclear cells gradually increase in number, and the small mononuclear cells correspondingly decrease until the adult relations are reached at about six years of age.

The eosinophiles' percentage, and the large mononuclear and transitional forms remain about the same until middle childhood. The same tendency for the white cells to revert to the embryonic type exists, and in consequence myelocytes are frequently seen in ordinary cases of secondary anemia.

*Secondary Anemia.*—In this blood disease the reduction of the number of red blood cells to 3,500,000 to 4,000,000, and hemoglobin reduction to 50 to 60 % with a slight leucocytosis and a relative increase in lymphocytes, reassures us that the anemia is of moderate severity. A reduction of the number of red blood cells to 2,000,000 and occasionally to 1,500,000, with a hemoglobin estimation of 20. to 30 %, with poikilocytosis and anisocytosis, and, especially in infancy, a few normoblasts and megaloblasts, will confirm the diagnosis of a severe secondary anemia.

*Chlorosis.*—Although chlorosis occurs in young girls, about the time of puberty, and has a rather definite characteristic clinical picture, the diagnosis should be confirmed by blood examinations. The confirmatory blood findings will show a very decided reduction in hemoglobin without corresponding reduction in red blood corpuscles.

*Pernicious Anemia.*—This being a rare disease in childhood and at times confused with severe secondary anemia, the diagnosis should be made cautiously and only after several blood examinations made on different days. The diagnosis can be made only by a thorough examination of the blood. When the blood findings show a constant and considerable reduction of specific gravity, a feeble coagulability, a marked reduction of the hemoglobin, *the reduction in red blood cells greater than in the hemoglobin* (thereby giving a high color index to the red cells, and permitting them to stain well) the reverse being true in secondary anemia; the red cell count seldom greater than 2,000,000, and frequently below 1,000,000, a preponderance of megaloblasts over normoblasts, extreme poikilocytosis, an absence of the tendency of the red blood cells to form rouleaux, a decidedly marked reduction, and sometimes almost absence, of blood platelets, with a diminution in the total number of leucocytes, but a relative increase in lymphocytes, we feel reasonably positive of a diagnosis of pernicious anemia.

*Pseudo-Lenkemic Anemia (Splenic Anemia).*—This blood disease usually occurs in infants and young children. It shows marked changes from the normal blood picture. In well defined cases it may resemble severe secondary, or pernicious anemia, with its low gravity, greatly reduced blood cells and hemoglobin, and numerous normoblasts and megaloblasts. With the marked increase of leucocytes, 20,000 to 50,000, the great enlargement of spleen, and sometimes the moderate enlargement of liver and lymphatic glands,

the diagnosis should present no difficulty.

*Hodgkins Disease.*—The blood in this disease shows the characteristic of a secondary anemia. In late stages, however, it may present the blood picture of a severe secondary anemia, and a polymorphonuclear leucocytosis of 20,000 or more, and in this respect the blood picture might resemble splenic anemia. The clinical picture of greatly enlarged glands, and the resulting pressure symptoms, should suffice to differentiate. It might be well to mention that an increase in the blood platelets, and in the transitional leucocytes, would further help the differentiation.

*Acute Lymphatic Leukemia.*—This is the most common form of leukemia in early life and can not be diagnosed without laboratory assistance. It is true in the early stages and toward the end of the disease, a leukopenia of 3,000 or 4,000 may exist. Usually, however, the leucocytes are increased from 50,000 to 150,000, and there exists a great relative increase in lymphocytes, about 90 to 98 %, chiefly of the large variety of the white cells, and a corresponding reduction in the polymorphonuclear leucocytes.

*Spleno - Myelogenous Leukemia.*—Here, again, a diagnosis can not be made without a blood examination, although we might be quite suspicious, from the clinical picture, of this condition's existing. The blood examination usually shows a greater increase in leucocytes than in the lymphatic type, sometimes numbering 500,000. If arsenic has been administered, the reduction in number may be very decided and may even approach the normal count. Ehrlich's and Cornil's myelocytes are present, and when in large number are considered pathognomonic. Polymorphonuclear neutrophiles are greatly increased in number, but not proportionately. There exists in considerable number basophilic (mast) cells, mononuclears and polymorphonuclears, which is quite a reliable diagnostic sign. Eosinophiles show a decided increase in number, with mononuclear forms present. The lymphocytes are increased in number, varying according to the type and stage of the disease.

*Typhoid Fever.*—The value of a blood examination in the early days of typhoid fever is fully appreciated by all physicians, for by no other means can we feel absolutely sure of our diagnosis. After ten days' duration of typhoid fever, of the helpfulness of the Widal test, as a confirmatory, or perhaps as a differential diagnostic test, we are all aware. A leucopenia, in the early days of typhoid, is always a strongly suggestive finding.

*Septicemia and Pyemia.*—This disease need only be mentioned in connection with blood cultures to emphasize the practical importance of laboratory work. In this connection I recall a recent case of lateral sinus septic thrombosis. The diagnosis was confirmed by a blood culture only, and a successful operation saved the child's life. Of interest in this special case was the fact that acute pyelitis existed, and also malaria plasmodium was found in the blood, which apparently accounted for the chills, subsequent sudden rise in fever, and a leucocytosis. There were no special outward signs, except pain in ear and a moderate discharge. It was the blood culture showing streptococcic infection that cleared the diagnosis and warranted the operation.

*Leucocyte Count.*—On account of its great assistance in leading us to a correct diagnosis, and its constant help in differential diagnosis, the leucocyte count is probably one of the most commonly used laboratory examinations. In cases of acute illness, with negative physical findings, and no justifiable diagnosis in sight, we all know its true value. A leucocyte count, in many instances, will prove to be the first thing to correctly direct us along the proper diagnostic road. For instance, a normal count will direct our consideration to typhoid fever, malaria or influenza. On the other hand, if a marked leucocytosis exists, it suggests acute pyogenic infection, as acute pneumonia, acute pyelitis, suppurative appendicitis, acute otitis media, acute mastoiditis, retropharngeal abscess, acute cerebro-spinal meningitis, or scarlet fever. We also know its value in acute pneumonia of infancy, with absent physical signs, and a ratio of pulse to respiration of two to one. A leucocyte count

of 20,000 to 30,000 will warrant a diagnosis of pneumonia.

A differential count further helps us in confirming a pyogenic infection. If pyogenic, the polymorphonuclear lenococytes are increased not only in number but proportionately as regards its normal ratio to the lymphocytes. If the lymphocytes are relatively increased, our attention is directed to diseases that cause a reaction in the lymphatic tissues or lymphogenetic centres of the bone marrow, such as syphilis, tuberculosis, and leukemia. Again, if the eosinophiles are decidedly increased, 10 % or more, it may give us the first suggestion or confirm an already existing opinion that our patient is infected with hookworm or other worms.

*Malaria.*—The necessity of a blood examination for malaria plasmodium in the diagnosis of malaria, I believe, is not sufficiently appreciated. Too much dependence is placed upon enlargement of the spleen and marked periodicity, and too little attention is given to the necessity of blood examination. There are some physicians who do not deem it necessary to have the blood examined for malaria unless the spleen shows enlargement. I would advise strongly against this practice. I have seen many cases of the aestivo-autumnal type in infancy with no palpable spleen; and one that I especially recall, of the pernicious type, with no detectable splenic enlargement. The blood, in this particular case, was literally loaded with malaria plasmodium, some cells containing two or three organisms. The clinical picture of this case corresponded quite perfectly to a diagnosis of acute intestinal indigestion, with marked toxemia. Marked indiscretion in diet immediately preceded the attack, and vomiting and diarrhea were the leading objective symptoms. A lucky diagnosis, due to hospital thoroughness, saved that child's life.

I do not know in what exact percentage malaria exists without splenic enlargement in infancy, but I feel quite sure that our text books do not give proper recognition and consideration to it.

*Wassermann's Test* in connection with syphilis need only be mentioned to emphasize its practical importance.

## SPINAL FLUID

The examination of the spinal fluid is as necessary in the diagnosis of meningismus, poliomyelitis, tuberculous meningitis, epidemic cerebro-spinal meningitis, meningitis due to other organisms, and syphilitic affections of the central nervous system, as the blood examination is in the diagnosis of anemia and leukemia. In diseases of the meninges it is the spinal fluid examination that is the most important factor, but due consideration must be given to the physical findings and history, in order to arrive at a correct diagnosis. The practical importance of spinal fluid examinations may, again, be shown best by reciting the findings in the more important diseases of the meninges. A clear understanding of what constitutes a normal spinal fluid is very necessary for a full comprehension of the abnormal fluid.

*Normal Spinal Fluid.*—Pressure is normal which signifies that when a patient is lying in a horizontal position the flow is perhaps 10 to 15 drops to the minute. The rate, of course, is somewhat influenced by calibre of the needle used, and the resistance of the child; struggling and crying increases the flow. Amount obtained usually averages about 5 to 10 c. c.; appearance perfectly clear, like distilled water; no fibrin clot nor web forms on standing; cell count shows very few cells, never more than 20 cells to the cubic millimeter. The vast majority of these cells are mononuclear. Albumin never over 0.1 %. Globulin faint trace, no increase; smears and cultures negative. Fehling's reduction normal. Animal inoculation negative.

In pathological conditions the fluid is practically always increased in amount. It may be either clear or cloudy.

*Clear Fluids*, with increase in amounts, usually point to tuberculous meningitis, poliomyelitis, meningismus, syphilitic involvement of the central nervous system, brain tumor, or, rarer, neurological conditions. There may occur, very rarely, in the first twenty-four hours of meningitis, a clear fluid. In rather acute cases of tuberculous meningitis and poliomyelitis a slightly cloudy fluid may be found.

*Cloudy Fluids* usually indicate, with the above exceptions, an invasion of the men-

inges by the meningococcus, or another pyogenic organism.

*Meningismus (Serous Meningitis)*, a condition in which meningeal symptoms arise in the course of some disease. The meningeal irritation, due to toxins circulating in the blood and not to inflammation, may be as marked in some cases as those of true meningitis, even to loss of knee jerks, dilatation and rigidity of the pupils, strabismus or ptosis. In such cases an exclusion of true meningitis can not absolutely be made without an examination of spinal fluid. The spinal fluid shows pressure increased, amount of fluid increased, appearance clear like distilled water, no fibrin clot nor web formation on standing, cell count normal (except rarely increased after convulsions), albumin and globulin normal, in rare cases slightly increased, but negative to Lange's colloidal gold test. It is believed by some that Lange's colloidal gold test is of decided help in differentiating meningismus with increased albumin and globulin from poliomyelitis, it being claimed that in meningismus, even though the albumin and globulin be increased, the Lange's colloidal gold test will prove negative, the reverse being true in poliomyelitis, smears and cultures negative, normal reduction in Fehling's and animal inoculation negative.

*Poliomyelitis.*—Here, again, the examination of the spinal fluid is of decided value in arriving at a diagnosis and in differentiating it from the other meningeal diseases. The spinal fluid shows pressure increased, amount of fluid increased, appearance usually clear, sometimes cloudy in severe cases, fibrin clot formation usually absent, occasionally a slight fibrin clot formation, cell count slightly to moderately increased, sometimes the increase is very great. the type of cell in a great majority of cases is the mononuclear, giving a lymphocytosis up to 95 %.

In a few cases there exists an excess of polymorphonuclears. This at one time was thought to be the rule in the early stages of the disease, but is now believed to represent a type of reaction and not a stage of the disease.

Polyform and endothelioid cells are often found. Cultures and smears show negative; albumin and globulin usually show a slight to a moderate increase, and a normal reduction to Fehling's. In a few instances, especially those showing the syndrome of Froin, the albumin and globulin are greatly increased and the reduction of Fehling's is diminished. Animal inoculation is negative.

*Tuberculous Meningitis.*—The diagnosis of tuberculous meningitis is at times troublesome to differentiate from poliomyelitis. If, however, we give due consideration to the history and clinical findings, and are thorough with our spinal fluid examination, the diagnosis should not be difficult to make. By thoroughness in examination I mean a diligent and proper examination of the fibrin clot for the presence of the tubercle bacilli. If the fluid has to be examined before a clot forms, the specimen should be centrifugalized and the sediment examined for the tubercle bacilli. The percentage of positive findings of the tubercle bacilli is not so great in the centrifugalized specimen as in the examination of the fibrin clot. Also, by thoroughness I mean the animal inoculation test which necessarily takes about one month for decision.

The spinal fluid shows pressure increased, amount increased, appearance clear, as a rule, but sometimes slightly cloudy. Fibrin clot present and the proper microscopic examination of clot shows tubercle bacilli in 90 % of cases, cell count moderately to greatly increased, and the mononuclears predominating up to 95 %. In a few instances the fluid is hazy with a preponderance of polymorphonuclears; also, as the case progresses, the polys increase in number; albumin and globulin show a larger increase than do poliomyelitic fluids. Fehling's varies from normal reduction to a failure of reduction. It has been stated that a point of difference between fluids of poliomyelitis and tuberculous meningitis is that fluids of poliomyelitis reduce Fehling's, while fluids from tuberculous meningitis do not. This is not true. DuBois and Neal, in the report of their New York cases, have shown that almost 75 % of their tuberculous fluids showed a fair to a good reduction of Fehling's, and a small number of poliomyelitis showed a diminished form of reduction. The animal inoculation is, of course, positive.

*Epidemic Cerebro-Spinal Meningitis.*—In this disease an early diagnosis is of prime importance. The diagnosis can be determined positively only by means of an

examination of the spinal fluid. A spinal tap, therefore, should be made without delay in all cases presenting suspicious symptoms of meningeal troubles. It might be well to state that when the fluid withdrawn is decidedly cloudy, anti-meningitic serum does no harm, no matter what the organism may be, and if it is meningococcic meningitis, the earlier the serum is administered the better.

The spinal fluid shows pressure increased, amount of fluid increased, and appearance decidedly cloudy. An extreme rarity in very early cases is for the fluid to be clear with organisms present in abundance, fibrin clot formation present, and oftentimes pus in the bottom of the tube; cell count usually enormously increased, polynucleosis up to 98 %, — very rarely, cell count may be only slightly increased. As the case improves the number of cells decreases, and the percentage of mononuclears increases. It is well to be sure that the organisms have disappeared from the fluid before placing much reliance upon the decrease in cells as a positive sign of improvement. That type of case is almost invariably fatal that has a rapidly decreasing number of cells with persistence of organisms. Smears are usually positive, showing the meningococci. Sometimes, especially early or late, when the organisms are too few in number to be positively demonstrated by smear, the culture will be positive. Cultures are generally positive.

The meningococcus autolyzes very quickly. Therefore, fluids from cases of epidemic meningitis should be examined as quickly as possible after being withdrawn. Examinations made after twelve hours are likely to be unsatisfactory. Forty-eight hours should be allowed for growth in glucose ascitic veal agar, neutral to phenolphthalein before pronouncing the culture negative. Occasionally, early cases of any form of purulent meningitis will show a perfectly sterile fluid in the first and even in the second tap. This case should be treated as meningococcic meningitis until the specific organism has been ascertained. Albumin and globulin are usually moderately or greatly increased; in cases that recover, the albumin and globulin decrease as the case improves, but they have rarely returned to normal by the time treatment is discontinued. Fehling's test gives normal reduction to a failure of reduction according to severity and stage. If the case is fairly mild the reduction may remain good all through the disease. Again, in many cases the reduction disappears at the height of the disease and returns as the patient improves. Fehling's test is, therefore, of some prognostic value in meningococcic meningitis. Fehling's test gives the same reduction reaction in other cases of purulent meningitis.

*Purulent Meningitis Due to Other Organisms (Pneumococcic, Streptococcic, Influenzal and Staphylococcic).* — In this form of meningitis the clinical picture presents the already existing systemic disease, or the focal infection, and thereby makes the diagnosis, before the lumbar puncture, highly probable. The diagnosis, however, can not be made positively without a spinal fluid examination. The spinal fluid examination has practically the same findings for all purulent meningitic cases, which of course includes the meningococcic form. The only positive way of differentiating them is by smear, which generally shows an abundance of the specific organism and by culture growth. It should be mentioned in connection with the influenzal variety that the organisms are usually not numerous in the smears, in marked contrast to the other forms of meningitis. They are readily grown upon blood agar but not upon ordinary media. If, therefore, from a decidedly cloudy fluid no growth occurs, influenzal meningitis should be suspected.

*Syphilitic Affections of the Central Nervous System.*—The great value in making a correct diagnosis in syphilitic involvement of the central nervous system is readily appreciated by all physicians. This diagnosis is usually accepted with resentment, and positive evidence of such condition existing is most important. It is valuable to know that the blood in this condition may be negative to Wassermann's test when the spinal fluid shows positive, indicating with a great degree of certainty syphilitic disease of the nervous system. Therefore, negative Wassermann in the blood does not exclude syphilis of

the nervous system. The blood is negative in not a few cases of tabes dorsalis, for example, even when no syphilitic remedies have been employed. The spirochaeta pallida has been found in the cerebro-spinal fluid, but it is more likely to be detected in the local syphilitic lesions.

The spinal fluid usually shows pressure increased, amount increased, appearance clear, sometimes slightly cloudy, albumin and globulin increased, fibrin clot present, cells usually slightly increased, chiefly lymphocytes, giving a decided lymphocytosis. Wassermann positive.

*Cerebral Abscess and Cerebral Tumor.* The differential diagnosis of cerebral abscess from meningitis, and likewise cerebral tumor from meningitis may at times present some difficulty. The practical value of spinal fluid examinations in these cases lies in the fact that lumbar puncture gives negative results in uncomplicated cerebral abscess and cerebral tumor, while it gives positive and definite information in meningitis.

## URINE

The great practical value of a thorough chemical and microscopic analysis of the urine is too well known to all pediatrists to require more than special stressing of a few practical points.

It is advisable to know the normal urine of infancy, otherwise we may be led into error.

*Normal Urine of Infancy.*—The amount of urine excreted in infancy is relatively larger than in adults, owing to the proportionately greater amount of water drunk by babies. The amount varies according to the amount ingested. The reaction in the first few days is decidedly acid, and later slightly acid or neutral. Specific gravity readings record lower than in adult urine. It is higher in the first few days than at any other time during infancy. After this it approximately varies from 1003 to 1008 in the first six months, and from 1006 to 1012 up to two years. It does not contain albumin, but small amounts of albumin may be present in the first days of life. Sugar is generally absent, but is not infrequently found in the first two months. It may be made to appear by increasing the amount of sugar ingested.

*Hematuria.*—The presence of blood in the urine is often of great diagnostic value. It should direct our attention to the following diseases: hemorrhagic diseases of the newly born, scurvy, purpura, hemophilia, and infectious diseases, particularly typhoid, scarlet fever, influenza and malaria. Also acute nephritis, new growths of the kidney, renal calculus, uric acid infarctions in the newly born, sepsis, trauma, new growths of the bladder, should be considered. The findings of blood casts from the renal tubules, or larger ones from the ureter, or bladder cells, would be conclusive evidence of the origin of the hemorrhage.

*Pyruria.*—Pus in the urine would, likewise, suggest consideration of the following diseases: vaginitis, pyelitis, pyelocystitis, pyelonephritis, pyonephrosis, renal tuberculosis and calculus. Sometimes the pus may come from an outside source, as when an abscess from perinephritis, appendicitis, or caries of the spine, opens into the urinary tract. Of diagnostic value in such instances it might be noted that there is a sudden appearance of pus in large amounts, and the duration of the pus is only a few days. The cultures from a catheterized specimen will further determine the nature of the infection, which is of considerable aid in diagnosis and prognosis.

*Nephritis.*—It is absolutely necessary in infants with fever of unknown origin to have a thorough chemical and microscopic analysis of the urine. The cause of the unknown fever is frequently due to acute nephritis. In older children and in infants the result of a urinary analysis will oftentimes confirm our clinical diagnosis of nephritis. The microscopical and chemical findings need not be dwelt upon; they are entirely familiar to you.

*Acidosis.*—In this recently much studied and baffling disease, I might say that the detection of a goodly amount of acetone bodies in the urine in the first day of illness before starvation produces them is considered by many to be of much value in diagnosis. There is one simple but practical test of the urine in which I have great faith in directing me how much alkalies to give and also as regards prognosis. It is the simple blue litmus paper

test to determine the reaction of the urine. Personally, I believe the reaction of the urine is the key to the situation. Whenever I have been able to get the urine to show alkaline reaction, my cases generally have cleared up, and I was able to reassure the parents of a probable recovery. On the contrary, when urine persistently remained acid I have invariably lost my little patient, but was able to prepare the parents for the death of the child. There is further value to this simple test, and that is by way of anticipation of acidosis. To my way of thinking, the anticipation method is the best treatment for acidosis. In our Children's Hospital we have established a routine practice of testing the urine of all children acutely ill, and especially the cases of bowel disorders, bronchitis and pneumonia, and keeping their urine neutral or slightly alkaline during the time of their acute illness. We believe that our mortality has been lowered in those diseases by this procedure.

*Phenolsulphonephthalien Test.* — This test is of practical value to determine the functional capacity of the kidney and in rendering assistance to prognosis. You are all familiar with this test, but it might be well to mention that the percentage excreted in two hours in normal children varies a little from the normal adult excretion. In adults normal is considered from 50 to 80 %; any percentage above 50 is usually considered normal. In normal children the average excretion is 75 %, and if the function is below 60 % it may be considered abnormal.

*Diabetis Mellitus.*—This disease need only be mentioned to emphasize the practical importance of a routine examination of the urine.

I feel that the object of this paper would not have been accomplished if I did not stress the importance of thoroughness in pediatric practice. We all know its necessity, but do we always practice it in our rush? Today success in pediatric work can be represented by two words, *knowledge* of our subject and *thoroughness* in our work. If we could only shout thoroughness from the housetops and hillsides, and instill into every pediatrist thoroughness in handling his every case, not only would infant and child mortality be lowered, but a greater and increasing respect would be entertained for this particular branch of medicine.

## DISCUSSION

*Dr. J. D. Love, Jacksonville, Fla.*—I should like to emphasize the importance of a more or less routine examination of these different secretions. But no matter how it is emphasized, the fact remains that it will never be done. Throughout the South physicians neglect doing this. In the first place they do so because many of them are overworked. They have so much to do that they can not take the time to make these examinations. In the second place, their income is so small as not to permit of their employing regular laboratory men for the work. In the third place, their patients are so poor that they dislike, or are unable, to pay the fees necessary for this work. We have there the same old but insufficient excuses to account for slurring over a very important line of work.

With regard to spinal puncture, I would say that I consider it a procedure that is not to be undertaken lightly. Dr. Kohlman has pointed out that lumbar puncture alone may so disturb the function of the choroid plexus as to favor infection if certain micro-parasites are circulating in the blood. Flexner has also pointed out that simple lumbar puncture accompanied with slight loss of blood or the injection into the spinal canal of sterile horse serum is sufficient to lessen resistance to the virus of poliomyelitis. We can understand that if certain specific organisms were circulating in the blood, then a spinal puncture accompanied with loss of fluid into the spinal canal would expose the central nervous system and meninges to grave risk of infection. For that reason, I believe that it is not to be performed as a routine piece of work.

With reference to blood examinations, I would say that here, again, the examination should not be undertaken too lightly; and I think that many of us are doing too much of it—that is, having the blood examined too often by men inexperienced as regards the Wassermann reaction. My own experience with this has been unfortunate. Laboratory men have not sufficiently standardized the test. There are too many discrepancies existing as to its interpretation, and some have so refined their technique that 75 to 90 % of healthy individuals will show a positive Wassermann. We can understand that if it is refined to this extent it is worse than useless, because we often condemn our little patients to weeks and years of needless treatment and expose their parents to the charge of bringing into the world a luetic child.

*Dr. L. W. Elias, Asheville, N. C.*—Dr. Mulherin has gone about his task in the most striking way. If he had just emphasized the importance of these examinations instead of first giving the diseases that you can diagnose by these methods, and so, by accumulation of data of that sort, emphasizing the point, he would not have carried the conviction that he has. So it seems to me that this important thing has been brought to

your attention in the best way that it could have been. Thoroughness, it appears to me, can not be over-emphasized. I, therefore, shall have to take exception to Dr. Love's remark that we are overworked and that this should excuse us from making these tests. Every one thinks that he is the busiest person alive, yet those that are really overworked do the best work. The best work is done by the busiest men in the country.

In the second place, poverty can not be pleaded as an excuse, because we all have friends who have a laboratory; and, if not, the state laboratory is available and we can use that. If you take the time and the trouble, these objections can be overcome. That is at the bottom of our lack of thoroughness. We do not take the time and the trouble and do not get the results. If there is any one thing that should be brought home to us, it is thoroughness; if we want to do the best for our patients and for our standing as pediatrists. So I would emphasize thoroughness in the following out of these things.

As to routine punctures, I have done quite a number (I do not know how many) of lumbar punctures, and I have never seen the slightest trouble arise from any of them. I know of other men doing them who are no better qualified than I; and I know of no case, except the cases recorded in literature, in which any bad results followed. Lumbar puncture should not be entered upon too lightly, but I think that it should not be considered the enormous surgical procedure that some think it to be. A good many years ago it was not performed except by surgeons; but this is not the case today. We should not be satisfied with a dry tap. We should consider that we have not done the operation thoroughly and do it over again.

As to blood culture, I understood Dr. Mulherin to say that in typhoid fever it is an exceedingly helpful thing. The youngest case I have seen was that of a child of fifteen months, whose blood showed the bacillus immediately, on the second day of the illness, and thus cleared up the diagnosis at once. It is very simple to make this culture. You just put the blood in and get your results quickly.

In connection with urine, one thing that Dr. Mulherin did not mention is a very simple one in studying kidney function,—increased specific gravity and an increase of the amount of urine at night. It should not be neglected, as it is so often, in determining the kidney capacity.

*Dr. L. T. Royster, Norfolk, Va.*—It seems to me that the question resolves itself into whether we want to find out what is the matter with our patients or not. There is nothing that is too much trouble in order to do this. None of us considers it too much trouble to take the temperature. If that is important, and something else is just as important, we also should do that something else.

I can not stress too strongly the last remark that Dr. Mulherin made concerning thoroughness of examination. That means stripping the patient. No patient should be examined without being stripped. I shall give you one example of the importance of this:

A child was brought to our office a few days ago with pain in the abdomen, of which it had complained for several weeks. It had been examined by eight doctors, none of whom had taken off the child's clothes. As soon as this was done it showed Pott's disease.

Regarding hemoglobin, I want to emphasize the value of the Sahli over the Talquist method.

In regard to the question of the routine blood examination of the ordinary cases, I would say that it need not be done, if it is apparent on the first examination in an office consultation what the condition is. Where it is not so apparent on the first examination, the leucocyte count should be made. You can rule out two or three important conditions in that way at once. It has been my experience also that an enlarged spleen is not by any means the rule in infancy and childhood in typhoid fever.

Concerning spinal fluid examination, there is one justification, if no other, for it,—wherever there is a suspicion of meningeal irritation. That justification is this: for only one condition in the membranes of the brain can we do anything. That condition is epidemic cerebrospinal meningitis. The child has a right to your knowing whether it has that or not, and can be cured. Pneumococcic and tuberculous cases we can not do anything for; but for epidemic cases. we can.

I was called to see a child that was critically ill with abscesses of the abdominal wall. The condition was so apparently streptococcic that I did not think of the spinal fluid for the moment. There was marked retraction of the head and I thought that it was probably streptococcic infection from the abscess or meningismus. I came near not taking the spinal fluid, thinking that the child would die. I was leaving the house without doing it, but I decided to go back and make the test. It proved to be epidemic cerebrospinal meningitis and was cured by the serum. During its convalescence it was operated upon for the streptococcic infection of the abdominal wall.

As for the urine, I do not see how we can get out of making a routine examination of this in every case we attend. All these things are done in my office, except the Wassermann, if possible, before the child leaves. Dr. Spicer, of Chicago, got up a little cup that is quite valuable. As soon as the child's clothes are taken off it usually begins to urinate. Before its clothes are removed I have this cup in place, so that when it begins to urinate we get the specimen. No examination should be considered except a microscopic, and I do not think that we should stop at less than a centrifugal specimen. This is done in my office while we are doing something else.

As to pyelitis, about one in five cases of obscure temperature that I have seen in consultation has been pyelitis. It remained obscure simply because no routine examination had been made. I made this statement before another medical association and mentioned citrate of potash, and one doctor said that he gave this in every case of fever, thinking that it would reduce the temperature. He was honest about it. The specimen of urine does not always show pus on the first examination, and sometimes not on the second, third nor fourth. I had a case in which only

on the fourth consecutive day did I find pus. The first specimen was as nearly negative as you would ever find urine. After you have exhausted every other means of finding what the condition is due to, keep on examining the urine, because many cases will later show pyelitis.

I want to emphasize one point, and that is the question of examining the ears of every child. This examination should be made routinely in every case. Every doctor should have a head-mirror and speculum. He might have an electric otoscope instead. I use one when I can not get the direct light, and I always carry this instrument with me. Without that, you have no means of finding out what is the matter. If you do not do all these things you have not earned your fee, no matter how little you charge.

*Dr. Arthur G. Jacobs, Memphis, Tenn.*—I wish to extend an invitation to you to visit the Babies' Hospital in connection with the City Hospital. You will find every child examined has a blood and urine examination; and whenever further examination seems necessary, that is also made, and made correctly. So the poor babies of Memphis have the advantage of a thorough examination. I watched that, and was so well impressed with the good it does and the advantage it means to us that I tried to introduce that system into my own private practice. Here were people paying me for medical attention to their children, and yet I hesitated to make a blood or urine examination or to examine the mother's milk because of the cost thereof. I felt that I was not rendering them good, straightforward attention and tried to introduce this thorough system of examination into my practice. I succeeded, in this way. I knew a young man, recently graduated, with a pretty good training, and I equipped a laboratory in my office and made him this proposition: "You shall have all the laboratory fees. If you examine the urine, you shall get $2.50, and for a blood examination the same. For examining the milk you shall get $3.50." Then, when called to see a patient, I told the family: "The pathologist will follow me. He will charge you $2.50 for examining the child's blood and $3.00 for the urine. I feel that the child should have these examinations made." I want to tell you how many objections I have had. Not one. Every family has met this increase without a murmur. It is not necessary for me to expand on the great value this has been to me, to find on my desk a thorough blood examination and urine examination. I found that I could introduce that system into my practice, and you can do the same. I have not had one objection in my private practice.

The subject has been covered so thoroughly by Dr. Mulherin and the other men who have discussed it that I shall not go into the value of it. You know that. There is only one thing I wish to mention. There should be an examination of all milk. I have known breast-fed babies to give trouble. That is of considerable value to me in some conditions.

*Dr. L. T. Royster, Norfolk, Va.*—I find eosinophilia whenever the stools are infected, except by the strongyloides. We make routine examinations of the stools, coincidentally with the other examinations, in our office; and we find more or less severe eosinophilia in the presence of intestinal parasites other than the strongyloides. I have not had enough experience with intestinal parasites to know why, but we find eosinophilia with other intestinal worms, but seldom with that.

*Dr. John L. Morse, Boston, Mass.*—It hardly seems necessary nowadays to emphasize the importance of both the physical and the laboratory examination of our patients. It seems to me that no man is doing his duty unless he strips every child the first time that he sees it and makes what laboratory tests are necessary. I have no sympathy for the busy practitioner. The one I am sorry for is the man who is not busy. The man who is so busy that he can not do his own work properly should get an assistant. There is nothing that is so great a help to an elderly man not only physically, but to spur him on to better work, as to have a young assistant. As soon as the assistant gets old, he wants a younger one to spur him on.

As to lumbar puncture, I am rather conservative on this question. I think that I did some of the earliest lumbar punctures done in this country, and I have been doing them ever since, and, so far as I know, have never injured anybody. Nevertheless, it is like the pitcher that went once too often to the well: some time it will be broken. I believe in doing lumbar puncture where there is a reasonable indication for it; but I do not believe in doing it as it was done last year on account of the scare concerning infantile paralysis, broadcast without any real justifiable reason for it.

I am not sure whether I misunderstood Dr. Mulherin, but he gave me the impression that the cerebrospinal fluid of tuberculous meningitis is usually clear.

*Dr. Mulherin.*—Appearance clear oftener than cloudy.

*Dr. Morse.*—A lot of men teach that. Now the fluid of tuberculous meningitis, in my experience, is almost never clear. It may seem so when you get it, but if you compare it with water you will see that it is a little hazy. You should not look for a clear fluid in this disease, but for one that is a little hazy.

About pus in the urine: When men get that on their brain, they are likely to make an improper diagnosis of pyelitis when the patient has not got it. There are few children in whose urine you can not get a few pus cells in the sediment. The men who know about pyelitis and look for it have to be careful not to make the diagnosis of it when it is not there, because they find a few leucocytes; while the man who does not know about it and does not look for it misses it entirely, even when it is there.

That brings up the subject of the use of laboratory methods in general. We must remember that the finding in the laboratory is no more certain to be correct than the finding on physical examination or on history. It has its importance, but it is only a relative importance. You have to take the whole picture together and must not always believe what the laboratory says when it

does not agree with things that you find out in other ways.

*Dr. William Weston, Columbia, S. C.*—Hardly any of us were prepared, when we commenced this work, to do all the work that is now suggested; but we must remember this: that if we are to be successful in pediatrics we must be thorough. We are obliged to be thorough. In all probability, those of us who are worthy to practice pediatrics will be overtaken by death still preparing to do this work properly.

*Dr. Mulherin (closing).*—If a man who is doing pediatric work is not inclined to be thorough, he should select some other line of medicine. Of course, all branches of medicine require thoroughness, but if there is one special line that requires it, it is pediatrics. We have all seen two young physicians start out in practice, gifted with equal intelligence. One likes his work and does it thoroughly, not making remuneration his prime object, but goes into detail and finds out what is truly wrong with his patient. The other does not care so much for turning out good work, but considers more the remunerative side. Invariably the result is the same: the first man goes ahead, wins confidence and glory, and steadily grows to be a bigger and better professional man; the other one stands still and does not make headway until he finally wakes up to the realization that he lacks thoroughness and never succeeds properly nor does himself justice until he adopts thoroughness as his slogan.

Dr. Royster, in his discussion, has very ably stressed the importance of thoroughness in pediatric work. Of course as he or some one else has mentioned, even an ophthalmoscopic examination should be made in special cases; in fact, when occasion requires it, every organ and fluid of the body should be examined upon the ground that the more information we have about our little patients the more intelligent and valuable will be our diagnosis and treatment.

Regarding the question that Dr. Royster asked me about strongyloides carrying an eosinophilia, I must confess that I can not tell him absolutely, as I have never had the blood examined in such a case. My impression, however, is that in all patients infected with worms, especially round worms, the blood will show an eosinophilia. It is well to qualify the word eosinophilia: 5 % does not necessarily mean worm infection, but if it averages 10 % or more, this, I believe, is indicative of some worm infection. I shall thank Dr. Morse if he will kindly give me his views on this subject of eosinophilia and worms.

*Dr. Morse.*—I do not think eosinophilia is to be expected in cases of pinworms. We do not, however, have much experience with worms in my part of the country.

*Dr. Mulherin.*—We do have many cases of worm infection in the South, but not many Georgians affected with strongyloides. We are endeavoring to systematize our work and study the subject a little more thoroughly at Augusta, Ga. My impression, as I mentioned before, was that all worms, including the pinworm which Dr. Morse mentioned, would give eosinophilia, but I am glad to acknowledge and accept Dr. Morse's opinion on the subject.

Dr. Love quite rightly questioned the word "routine" in connection with the title of my paper. In first writing my paper I specified my definition of routine examination, but realized that my paper was entirely too lengthy to be read in fifteen or twenty minutes, and therefore cut the paper right and left. In explanation of the word "routine" I mentioned that a child having colic, coryza or some minor but perfectly apparent trouble, should not have its spine tapped, blood and urine examined as a routine measure. Such things should be done only when subjective and objective symptoms warranted these examinations.

I do not believe in tapping the spine unnecessarily, and, as Dr. Love has mentioned, there is a possibility of doing some harm. But we must remember that that possibility does not outweigh the advantage to the child if there be the slightest likelihood of cerebrospinal meningitis existing. The child surely has the right, as Dr. Royster has mentioned, to have the serum if it has epidemic cerebrospinal meningitis. Also, Dr. Royster has correctly remarked that there are many children who die from cerebrospinal meningitis, where a correct diagnosis should have been but was not made, and the child should have received anti-meningococcic serum but did not. These facts should emphasize the importance of an early tap wherever there exists cerebral pressure symptoms or signs of meningeal irritation. In deciding this question of when to tap, I have practiced this little trick, which I have found to be of great value to me. I ask myself: "If this were my child, what would I do?" I think this question will always make us act conscientiously and correctly.

The point that Dr. Elias mentioned about testing specific gravity and estimating the quantity of urine voided in twenty-four hours is a very simple and important test, and should have been mentioned in my paper. My only excuse for not incorporating it would be that the subject assigned me by our worthy Chairman was a little broader than the time allotted would permit for the reading of the paper. In closing I wish to state that in writing this paper it was not my purpose to lay too much stress upon the laboratory side to the detriment of the clinical side, the stronger and more reliable of the two. We are all aware that it is the happy combination of the two that gives us the sensible, scientific diagnosis. The importance of the clinical side might be mentioned in connection with taking cultures for diphtheria diagnosis when we get a negative report from the laboratory. It sometimes happens that we have to ignore the negative report, for, with a resisting child it is often impossible to mop the outer surface of the membrane that chiefly contains the germs, and therefore have to rely mainly upon our clinical picture. I recall one case in particular, in the home of a brother practitioner, where I saw a little patient whom I felt sure had nasal and pharyngeal diphtheria. I gave the child 10,000 units of anti-diphtheritic serum and took the culture. The report next morning was negative. I was still convinced that

the child had diphtheria and as results were not satisfactory, I repeated 10,000 units and took a second culture. The second report came back negative. I was still of the opinion that the child had diphtheria and gave a third dose of 20,000 units, as the results were still unsatisfactory, and took a third culture. The report next morning came back positive for diphtheria. but fortunately I had given a sufficient amount of antitoxin to safeguard the child. I do not mention this case to detract in any way from the laboratory side. Personally, I strongly believe in the laboratory for diagnostic purposes, but occasionally only for verification of clinical findings.

## MALARIA IN INFANTS*

BY MORGAN SMITH, M.D.,
Little Rock, Ark.

Malarial infection is less frequent in the infant than in the child or adult. This is probably not due to any natural protection possessed by the suckling, but to the vigilance on the part of the mother to protect her baby from the bite of all insects. Until the runabout age is reached the infant takes its day naps and sleeps at night under a cheese-cloth canopy or other similar protection. The discovery of a bite on her baby incites the mother to renewed efforts for its protection. Living under the same conditions, the infant is as liable to malarial infection as the older child or adult, and the closer the observation the more convincing becomes this statement.

No stage of life is exempt from malarial infection; infants being less frequently affected than children, children more so than adults. Those physicians who make, or have made for them, routine blood examinations in all their cases can come to but one conclusion—namely, that malaria is more common in infancy than is generally supposed, and the authentic reports of cases of pre-natal infection would lend support to this conclusion. The tertian and double tertian forms are more common than the estivo-autumnal; the quartan is rarely observed.

It would seem that in a disease so well understood as malaria, and whose symptoms are so clear-cut, that errors in diagnosis would be very infrequent. This may be true in the older child and adult, but in the infant the sequence of the classical triad of symptoms — chill, fever and sweat—is broken, and the chance for error is exceedingly great.

The onset of a malarial paroxysm in the infant is less dramatic than in the adult, the chill is rarely present and the cold stage being of considerably shorter duration. But the fever is nearly always preceded by a more or less cold stage, manifested by coldness of the nose, ears, lips, fingers and toes. The features are pinched; the fever rapidly mounts to a high mark. Vomiting is almost constantly present, and when persistent is followed by great prostration. However, it is to be noted that prostration is the exception rather than the rule, unless preceded by vomiting. In the rachitic and artificially fed, convulsions often usher in the first stage and mumbling and twitching are marked. In an infection so abrupt and profound, it would hardly be expected that the gastro-intestinal tract—ever so sensitive and responsive to the slightest irritation—would escape disturbance, and so diarrhea of the simple type is a common condition. In fact, in many cases, gastro-intestinal disturbance is the dominating picture. The younger the infant, the more apt is this to be true. Most infants sleep profoundly during the stage of high fever, and deep stupor often marks this stage. Subsidence of the fever is not marked by sweating as in the older child, and in those cases of double infection where one paroxysm overlaps the other the skin remains warm and dry. This is in contra-distinction to what occurs in the adult.

The spleen at the onset may or may not be palpable below the costal margin, but in recurrent and untreated attacks it is almost always enlarged. In the chronic type it is exceptional not to find a hard and palpable spleen. The "iliac spleen" is so rarely observed that its presence is rather to be looked upon as a curiosity.

Any periodical recurrence of indisposition, however slight, in an infant living in a region known to be infested with malaria-bearing mosquitoes, or who has recently resided in such a region, should be considered to be malaria until proven to be otherwise; but the presumption of ma-

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laria should not preclude the employment of those diagnostic aids which are necessary for the making of an accurate diagnosis.

Mild and unrecognized cases of malaria are the dangerous ones, for they result in those progressive nutritional disturbances which leave their impress upon the system. In a field survey made of thousands of children, the author is of the opinion that many cases of infantilism attributed to hookworm disease should be charged to chronic malaria in infancy. Many cases of infantilism were observed in localities free from hookworm infection. Unfortunately, at the time this survey was made, blood examinations were not made to determine the presence of malarial parasites, as the investigations were made for the determination of another disease.

The difficulties encountered in diagnosing most of the diseases which affect infancy do not hold in malaria, for the reason that a positive diagnosis can be made in a reasonably short time, provided a sufficient number of blood examinations be made. The one disease which simulates malaria more than any other is pyelitis. Chilly sensations, vomiting, fever and an irregularly marked intermittency of paroxysms in a female infant occurring in the summer, and in a malarial region, are strong clinical evidences of malaria. This same group of symptoms is also characteristic of pyelitis, now recognized to be a very common affection in infants and children. The symptoms of acute malaria more nearly resemble those of pyelitis than typhoid fever, the latter disease, however, being very often mistaken for malaria. As observation shows that many cases of pyelitis produce but few, if any, general symptoms, the finding of pus in the urine should not prompt a hasty conclusion, but the blood as well as the urine should be carefully examined. Estivo-autumnal infection more nearly resembles typhoid, the remitting type of fever being the principle point of similarity.

Malaria, like syphilis, is protean in its manifestations, and in the irregular forms presents many confusing diagnostic difficulties. Some cases are distinctly of a cerebral type, strongly simulating meningitis; others are markedly pulmonic and are mistaken for acute pneumonia. As enlargement of the spleen is generally considered one of the most constant symptoms of malarial infection, syphilis, rachitis, leukemia and the secondary anemias must be considered in the differential diagnosis. Chronic malaria in children is common; in the infant, rare. No attempt is here made to give a full symptomatology of malaria.

Malaria, whether occurring in the infant, older child or adult, is a serious disease and demands the most prompt recognition and treatment. A positive diagnosis can not be made except by blood examinations. A negative blood examination does not exclude malaria; not one, but many and frequent specimens of the blood, taken at different stages of the disease, should be made. A therapeutic diagnosis should not be made unless it is impossible to make a diagnosis by blood examination.

The treatment of malaria in the infant does not differ from that employed in the child or the adult.

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## DISCUSSION

*Dr. William A. Mulherin, Augusta, Ga.*—The subject of malaria in infancy, I feel, is deserving of a very free discussion. for it is too important a subject to let pass without a very free exchange of ideas from Southern pediatrists. This Pediatric Section of the Southern Medical Association has an obligation to fulfill in the South on just such subjects as are common in this section of the country, and it is therefore our duty to study malaria in infancy and present to the profession reliable data on this important subject. As I mentioned in my paper, just read, the importance of blood examination in the diagnosis of malaria, I stressed the very point that Dr. Smith has also brought out in his paper, that is the fact that splenic enlargement is not infrequently absent in malaria in infancy. It should, however, be looked upon as a valuable diagnostic sign, but should not be regarded as a constant sign in malaria in infancy. By splenic enlargement is meant a spleen that can be palpated.

Almost all of the text books on pediatrics state that the enlargement of the spleen is a constant occurrence in malaria, but those who have studied their little patients carefully will have to differ from these assertions. The Southern pediatrists' obligations in such subjects are emphasized by just such facts. Our text books are, as a rule, written by Northern men, and I say this with a desire to grant them all due credit, but these men see so little malaria that they are not fully qualified to write authoritatively on this subject. Therefore, the statement and belief that the spleen is invariably enlarged has been passed down to us empirically from year to year, and it is our duty

to collect data and show that these statements are slightly in error.

I wish to expressly state that I do not wish to convey the idea that the spleen is not enlarged in malaria in infancy as a general rule, but I do know positively that the absence of splenic enlargement is not an uncommon occurrence in this disease in infancy, especially in the estivo-autumnal type. To make an absolutely authentic estimate of the percentage of cases that have not splenic enlargement would be, at this time, unwarranted; but I am at present endeavoring to collect reliable data along this line. I will venture to say that fully 20 %, or more, of cases of estivo-autumnal type of malaria in infancy will show no splenic enlargement. This fact, if it can be borne out by statistics, should impress on our minds the importance of blood examination in the diagnosis of malaria in infancy. I recall one case that opened my eyes along this line and gave me food for thought. The case in question was a two-year-old child. I saw the little patient, with a history of having eaten pickles, peanuts and watermelon; vomiting, diarrhea and sharp fever was the picture presented when I examined the child. A thorough examination, which was done as a routine measure, revealed no splenic enlargement; in fact, physical exanmiation was negative and pointed directly to the diagnosis of acute gastric and intestinal indigestion. Stomach washing, thorough cleansing of the bowels and starvation apparently improved things, but did not cure. The next day, stupor, apparent intoxication, a continuance of fever and diarrheal symptoms were present, but no splenic enlargement. I had the child moved to the Children's Hospital, as it lived a short distance out of the city, and a thorough examination of urine and blood was made, with the result that this child's blood was literally loaded with estivo-autumnal type of malarial organisms, some cells containing two or three organisms. The spleen at this time did not show any enlargement. The child was given quinin hypodermically, and made an uneventful recovery. The ten days that this child was in the Hospital the spleen was examined daily for enlargement with negative results. If a thorough blood examination had not been made in this child's case it would have died from malignant malaria, and I would have signed the death certificate "acute intestinal indigestion, with intestinal intoxication," and, in my ignorance, would have believed that I had done everything possible to save this child. How many cases had gotten by us before we saw this one I do not know, but we are endeavoring very hard to have no more slip by us without having the blood examined.

There is one other point in malaria that interests me very much, and I think should be brought out, and that is the latent form of malaria, where the infection lies quiescent in the child, but anything tending to lower the vitality flares up the infection. We have all seen these cases, and only the other day I had a little case who had an attack of indigestion, of mild severity, and had apparently fully recovered, when suddenly, without evident reason, the fever jumped to 104 or 105°. The spleen in this case showed no enlargement, but the blood showed malaria plasmodium. It was the lowered vitality, following the digestive disturbance, that allowed this latent form of malaria to become acute.

*Dr. W. W. Harper, Selma, Ala.*—I will cite two cases to show—

1. The importance of routine blood examination.

2. To recall to those who practice in malarial districts the fact that there is a disease—pyelitis—that closely simulates malarial fever.

I agree with Dr. Love that the busy practitioner has not the time to do routine laboratory work, but if he is a busy doctor he can well afford to employ a competent laboratory technician. Then the patient can have the benefit of not only a thorough physical examination, but also a complete examination of the blood, urine, feces, and sputum. Such routine examinations will reveal many surprises. Frequently one will find a pillar of the church falling down from lue; and malaria, which has been the haven for so many derelect doctors, will be submarined.

Case 1.—Baby was having a chill and high fever every other day. Examination of urine was negative, blood showed no plasmodia, nor evidence of malaria. There was a high leucocyte count with an increase of neutrophiles. Pyelitis was suspected, although nothing was found in the urine. Several daily examinations of urine finally showed pus and the colon bacillus and the baby recovered under the use of autogenous vaccines—all other measures having utterly failed. But for the repeated urine examinations and the routine blood examination, this baby would have been treated for weeks for malarial fever, as the clinical signs were those of malaria.

Case 2.—Child was seen in consultation. It was running a typical malarial course. The doctor, who believed in malaria, would accept no other diagnosis and had the baby covered with abscesses as a result of giving quinin hypodermatically. Examination of urine showed pus and under proper treatment for pyelitis baby made a quick recovery.

*Dr. Frank P. Gengenbach, Denver, Colo.*—Our personal experience impresses us the most. I know of a case in which a young child living in Denver had a condition that tried our diagnostic skill until we made a blood examination and found the plasmodia. We see very little malaria in Denver. We are, therefore, likely to overlook it. It was not until our blood examination showed these parasites that we learned that the child had stopped for one day in a district infected with malaria.

*Dr. J. K. Eugene Rosamond, Memphis, Tenn.*—Even when the patient lives in a malarial district all the time, the history of exposure to malaria is very important. It would be just as important in Memphis as in Denver. We have screened houses and city ordinances against mosquitoes, and we can find out whether there has been a cook or other servant or any other adult about the place who has had chills and fever, whether there are screens on the porch, whether the people in the house sit on the porch, whether there is shrubbery around the house likely to harbor the anopheles, etc. I should like to ask Dr. Smith

what he means by a survey of one thousand cases of malaria without blood examinations?

*Dr. D. W. Jones, Jackson, Miss.*—I want to cite a case showing the importance of routine blood examinations, no matter how small the patient. A rather obscure fever in a child eighteen days old recently proved to be tertian malaria. A convulsion followed by high fever suggested the possibility of malarial infection, and a blood smear demonstrated many parasites.

*Dr. H. Leslie Moore, Dallas, Tex.*—That recalls to my mind a premature child, a 7 months' baby that was put in an improvised incubator. On the ninth day it developed a temperature of 102°. No blood examination was made. The next day, the temperature went to 105°. Blood examination then showed the estivo-autumnal parasites. The child's life was saved by the early diagnosis of the condition. It was a charity case, admitted to the hospital because the mother was suffering from acute Bright's disease. On subsequent inquiry it was found that the mother also had malaria for several days previous to her confinement.

*Dr. Hugh Boyd, Scottsboro, Ala.*—There is one point that I want to mention, and that is that in acute malaria you do not often find an enlarged spleen in an infant, but in cases of latent malaria, you practically always find it. A baby who, in the fall, becomes infected with malaria, has given to it a few doses of quinin and gets better. will, in the following Spring, March or April, begin to get sick and have chills. You take a specimen of the blood and examine it and you will find the malarial parasite. Then, when you examine the child's abdomen, you will find the spleen enlarged in every case. Not only in the Spring, but early in the Summer, is this condition found; and practically all cases will show an enlarged spleen for months afterwards, counting from the time of the chill, unless given intensive treatment. The spleen may not be so very large, but it will be enlarged and somewhat hard. We sometimes find in infants a very large spleen. I have a child, now eight months of age, which I was called to see, as well as its brother, three weeks ago. About the first of August these children had been taken to a district where they were almost eaten up by mosquitoes one night. Two weeks later they began to have chills, and when I saw them the spleen of this little 8-months'-old baby reached to the iliac crest and almost across the abdomen. The little boy's spleen was almost as large. They both showed double tertian infection. I mention this only to emphasize the point that in acute malaria you rarely find much enlargement of the spleen; but that in chronic or latent malaria you practically always find it.

*Dr. L. W. Elias, Asheville, N. C.*—Coming, as I do, from the mountains, I have no right to speak on malaria; but I want to ask what is the prevailing dose of quinin? The few cases that reach Asheville come with remarkably small doses and get very little improvement.

*Dr. H. L. Hamilton, Lambert, Miss.*—I am not a pediatrist, but I live in the Mississippi Delta; and a good deal of my practice is in cases of malaria. A good many of them have either had no treatment or have had improper treatment. I wish to reply to Dr. Elias about the dosage. I have been treating this disease for fourteen years and have found from experience that, in treating infants and children especially, we give too small doses of quinin. Recently I have changed my plan of administering this drug and give quinin in proportion to the severity of the illness, disregarding the age of the patient. I have given a child fifteen grains at one dose. In fact, when the children are unconscious, convulsive or comatose, I give as much as thirty grains at a dose. Since I have been giving these large doses, I have lost but one case in five years; whereas before that I had four die in one year.

*Dr. Henry Enos Tuley, Louisville, Ky.*—I wish to ask the essayist whether he would not sometimes use something besides quinin? We, in Kentucky, see very little of malaria. At Camp Taylor, in Louisville, it was found that among twenty-eight thousand troops in the cantonment there were only three cases of malaria, and we believe that in all these cases the disease was imported. The survey made recently by the Public Health Service has been productive of very few cases that have been reported. We look to the men in the South, who see a great many cases, for the clinical history of the cases and the treatment particularly.

I wish, in connection with these three cases in the camp, to say that I was talking to the Major in charge of the medical cases at the base hospital, who said that they were of the estivo-autumnal type, and that they did not respond to quinin; but that when cacodylate of soda was given, the parasites disappeared.

*Dr. Smith (closing).*—In reply to Dr. Rosamond's question, I wish to say that the survey referred to was made for the determination of hookworm infection, therefore blood examinations were not made.

It is my observation that in the acute stage of malarial infection the distinctly palpable spleen is more often absent than present. It has been said with great truth that the one and ever-present pathological condition in malaria is an engorged and enlarged spleen. But the sp'een may be enlarged and yet not be palpable below the costal margin. In the chronic type of malaria in the older child, it is rather the rule to find the spleen enlarged and palpable. As "one swallow does not make a summer," neither does an enlarged spleen guarantee the diagnosis of malaria, nor does the fact that the spleen is not palpable below the costal margin warrant the assumption that malaria is not present.

I remarked in closing my paper that the treatment of malaria in the infant did not differ from that of the child or adult. I may be permitted to make some slight qualification of this statement. I have very definite views both as to the manner and method of administering quinin to infants and children for malaria. Preference is given to an acid solution. The bitter taste of quinin is not very objectionable to the infant and young child, this indifference to its taste decreasing as age advances. The drug is given at stated intervals, the dose being doubled two hours before the expected paroxysm. The advantage of the acid solution is that absorption is assured, the thing which is most desired.

On account of sloughing which frequently follows the hypodermic administration of quinin in infants, this tendency being increased because of the very small and immature muscles and large deposits of fat, it has not been my practice or teaching to use or favor this method. I have not employed quinin in infants intravenously for the reason that I have had no occasion to do so, the acid solution by mouth meeting all requirements.

The administration of quinin in capsules to children is, to say the least, very unscientific and undependable. There is no assurance that absorption will take place, and the child's statement of "ringing in the ears," etc., is no evidence of the desired cinchonism. In fact a few grains of quinin are often sufficient to produce such a symptom. It is a matter of common observation to find several capsules in the stool or in the vomitus.

Valuable time is often lost by preceding the administration of quinin by a slowly-acting purgative. If it is necessary to empty the intestinal tract, it should be accomplished with a sweeping dose of castor oil or magnesia. As the paroxysms in the infant oftentimes seem to overlap, and the clear-cut stages of chill, fever and sweat are absent, no time should be lost in the administration of quinin. It is my practice to give it until the fever has disappeared and to give "run over" doses to make sure that the last straggling crop of parasites has been caught.

While infants and children bear relatively larger doses of quinin than adults, I should hesitate to give an infant fifteen or twenty grains at a dose. The remarks of Dr. Hamilton are very interesting and, as I have changed my views many times, I may, in the light of further experience, lose the timidity of dosage which I now hold.

*Dr. Hamilton.*—If I found an infant who could not be roused by any other method and who was going to die, I would give it.

*Dr. Smith.*—The giving of quinin is very much like the giving of antitoxin: one can never tell in advance just what the minimum dose should be. But in the case of antitoxin the dose can hardly ever be too large, while in malaria it is possible that too large doses might produce some serious symptoms. I am thankful to have heard the experience of Dr. Hamilton, and shall give larger doses in the future if I can adopt his views. The length of time over which cinchonism should extend depends upon the particular type of infection. And one thing to bear in mind: "run over" doses or "good measure" doses are often necessary to effect a cure. These catch the last sporulation.

*Dr. Weston.*—How much do you give?

*Dr. Smith.*—I rarely give over two grains at the dose and would give such a dose for a definite period—that is, until the fever had subsided and all evidences of infection had disappeared.

In regard to the question brought out by Dr. Tuley, I am of the opinion that every case of recent malaria can be cured by the administration of quinin alone. In certain chronic forms in older children, and in which quinin has been given rather indiscriminately, resort must be had to some of the arsenical preparations.

*Dr. Weston.*—Will you tell us what form of the drug you use?

*Dr. Smith.*—I use the sulphate, in an acid solution. Children do not vomit quinin in this form as much as in syrupy mixtures. They have a considerable tolerance for quinin and will retain it as well as anything else.

I am speaking of acute malaria in infants and not in older children. I have not seen a case of pernicious malaria in an infant and feel that I have time to administer the drug by mouth and expect results. I should not hesitate to administer it hypodermically, however, if I thought it necessary.

*A Member.*—Have you ever seen salvarsan used?

*Dr. Smith.*—Not in an infant. I should hesitate to employ it in the case of infants. It is not necessary.

*Dr. H. Leslie Moore, Dallas, Tex.*—May I report a case of blindness in a female three years of age? The child had had three or four days of fever and the periodicity made me know that it was malaria. I gave her three grains of euquinin every three hours until she had taken twenty-four grains. On the second morning after the quinin had been started she woke up after the sun was up and said, "Mother, please turn on the light." The mother thought nothing of this at the time, but went on with her work. The child, after a while, said again, "Mother. turn on the light; it is so dark." Then the mother discovered that something was wrong and immediately telephoned me about it. I told her to stop the quinin and bring the child to the hospital, which she did. Examination was made by Dr. Cary, of Dallas, who found an optic neuritis present. In thirty-six hours the child began to see again and in forty-eight hours the sight was practically restored completely. She was then put on Fowler's solution, and no further quinin was given.

*Dr. Weston.*—I suppose you mention this case as an example of idiosyncrasy to quinin rather than as a contraindication to the giving of quinin. You do not know of other cases?

*Dr. Moore.*—No; just this one case.

## A CONSIDERATION OF THE LITERATURE ON ACIDOSIS*

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Renewed activities of study in recent years have done much to broaden our conception of acid intoxication. Investigations of the past were seriously handi-

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capped by the investigators' inability to conceive of any possible causative factor other than the ketone group. A gradual clearing of ideas has placed the acids and acid salts on an unquestionable etiological foundation.

Normally the blood and tissue fluids are maintained with a slight alkaline reaction. One readily accepts that not infrequently the intake in absorption in health or the abnormal production and absorption in deranged metabolism may bring to the tissue fluids relatively large amounts of bases or acids over and above the amount required. Under these conditions the reaction is unchanged, or, if changed, is quickly readjusted. The existence of a well working regulatory mechanism is evident.

Acids are disposed of by oxidation, neutralization and elimination. The selective power of the kidney is remarkable in its elimination of an acid urine from slightly alkaline body fluid and its ability to excrete alkalies equally as well. In order that acids and acid salts in variable amounts may be accessible potential alkalies which may meet necessities. We find that tissue and tissue fluids do hold alkalies in reserve.

As to what constitutes alkaline reserve, Van Slyke[8] and his collaborators clearly point out that free carbon dioxid is present in the body fluids in such concentration that it automatically converts into bicarbonates all bases not bound by other acids. The bicarbonates therefore represent the excess of bases which is left after all nonvolatile acids have been neutralized and are available for the immediate neutralization of further acids. In this sense they constitute the alkaline reserve of the body, which is maintained at a definite level. L. J. Henderson, of Harvard, concurs in the opinion that the bicarbonates are specifically the alkaline reserve. The bicarbonates are insured by the other fixed tissue alkalies and by protein metabolism. Normally in nitrogenous metabolism the end products are urea and carbon dioxid. In the presence of acids endangering the reserve alkalinity, the nitrogenous metabolism is halted, as it were, and a varying amount of ammonia is diverted to unite with the acids to form ammonium salts, which appear in the urine as such.

In a state of acidosis acids are present in the body fluids the neutralization of which is accomplished by the use of reserve alkalies. This process gives rise to a change whereby physico-chemic reaction of the blood approaches the neutral with a tendency toward acidity. However, in the most severe acidoses, the tissue fluids are never even faintly acid, so that acidosis defines itself as a state in which there is loss in the blood alkalinity. Since the actual acid state is never reached even in fatal cases the question arises as to whether the toxicity is not essentially due to the loss of alkalies in the tissue and body fluids rather than to the acids which are neutralized so completely that the tissue fluid reaction is maintained at least neutral. Sellard seems to lean toward hypoalkalinity as the causative factor.

Again the question arises as to how broad an application we are to give to the term "acidosis." If we accept the definition that it is a state in which there is loss by the body fluids of its alkaline reserve in varying degrees, then it should be applied to the mild as well as the severe intoxications. We classify (1) the primary acidoses, including the usually severe types in which no underlying cause is manifest and cyclic vomiting; (2) the secondary acidoses, including diabetic, nephropathic, acidoses associated with acute infections, infectious diseases, high temperatures, post-anesthesia, acute intoxication, as in the diarrheas, chronic toxemia of malnutrition, starvation, etc.

The source of the acid products which enter into the disturbance of the acid-base equilibrium has been variously explained. The possibilities suggested are:

1. That they are acids or acid salts which are produced and absorbed in excess, the derivations of which may be the excessive products of abnormal bacteria life or the acid products of deranged metabolism;

2. That they are the abnormal acid products of a diverted tissue metabolism;

3. That they are the acid products of normal metabolism, which accumulate on account of defective elimination;

4. That the acid products become excessive because of abnormal loss of alkalies.

Considering the first possibility, exces-

sive bacterial life with its acid products may of itself be sufficient to disturb the acid-base equilibrium, or may enter into the abnormal catabolism. Evidence of intestinal putrefaction is supported to a certain extent by the fact that indican is frequently in excess. Much discussion has been advanced in the support of the opinion that the condition arises from the absorption of acid products due to incomplete combustion in abnormal fat metabolisms. This view is supported to a certain extent by clinical experience. A diet relatively high in fats and proteins with deficient carbohydrates seems capable of producing the condition. It has long since been known that a carbohydrate-free diet in a diebetic is conducive to the development of acid intoxication. Proteins when abnormally or incompletely broken down may produce very toxic and strongly acid compounds. Vaughan[8] has shown that this is especially true of milk caseins. It is a matter of experience that it is very much wiser to withhold milk during the acid state and until convalescence is well established. Kerley[9] has used with good effect in children subject to cyclic vomiting a diet from which milk, milk products, butter and egg yolk are excluded.

The second possible cause, that there is excessive acid production by abnormal tissue metabolism, only permits us to theorize and is therefore dismissed from further discussion.

Considering the third possibility, the writings of Howland and Marriott are most interesting in their discussion of acidosis occurring in the course of diarrheas. They believe that the acid products are those of normal metabolism, which become excessive due to defective elimination by the kidneys. The acid phosphates in these cases are by them given prime importance etiologically.

With regard to the excessive alkalies, Steinitz[1] has shown that in children fed on high fats and losing weight, alkalies, especially soda and potassium, are excessive in the stools and that this loss is exaggerated if a diarrhea be present at the same time. His conclusion, however, is of little value since he fails to estimate at the same time the loss of acids and acid salts.

Recently some Eastern workers have reported the occurrence of acidosis in group cases. This necessarily would bring up the consideration of a specific organism. It seems likely that acidosis, especially the so-termed primary form, is more frequent in Southern climates. We have long since learned that frequently the cases occur more often in groupings than singly. The cause we have attributed to high, close heat, and possibly to common dietetic conditions, circumstances, and errors. Sultry hot days, followed by close, sleepless nights, are most excellent precursers of a case or group of cases of acidoses. One must appreciate that in cities and thickly populated districts the milk and food supplies may be similarly subject to conditions which render them a little below par. Further keeness of enthusiasm may overproduce evidence in that it reaches out and gets together cases which heretofore had been considered singly, and which may present rather astounding aspects when taken collectively. However, the possibility of infection, like many phases of this general consideration, is open to and worthy of investigation.

So far as we are able to judge, little new has been added to the pathological anatomy. Lackner and Gauss, of Chicago, report very fully and interestingly pathological findings in a single case. They find marked fatty degeneration especially of the liver and kidney, and to less extent fatty changes in the heart muscles and other organs. Their conclusions are worthy of note.

"There occurs in acidosis lipemia from the failure of the body tissues to utilize the fat in the blood.

"Lipuria, an outward manifestation of lipemia, also resulting from the excretion of fat in the waste products of the kidneys, as fatty casts.

"Fatty infiltration of the liver, which is a physiologic accumulation of fat from the blood.

"Fatty degeneration of the kidneys resulting from acid intoxication.

"Anasarca, resulting from impaired internal and external respiration."

Acidosis occurs far more frequently as a secondary condition and more commonly in the under or poorly nourished. It has been our experience that the primary forms more often appear in children at least fairly well nourished, occurring also in solely breast-fed babies in good state

of nutrition. Further, that there may be a distinct familial element. In this type the infant almost without exception thrives on the breast to about the eighth month and the acidosis occurs after this time; however, not uncommonly within the period of breast feeding, or it may occur when attempt is made to add to the diet. As to just how much alcoholism on the part of the parent or parents enters into the effect is problematical, but it has impressed us because of the rather frequent history.

We have never seen a case under the sixth month. Chapin and Pease report thirty-four cases, one of which was nursing.

The presence of at least reddened tonsils in many of these cases at onset is striking. The inflammatory condition does not seem sufficient to act as a primary basis, and its presence is often found only by routine examination. The possibility of the tonsils acting as a focus of infection with possible unnoticed developing changes in the kidneys has presented itself to our minds. This line of thought has been accentuated by the writings of Howland and Marriott. These children need not belong to the class which are subject to the symptomatic or repeated attacks of acute tonsillitis.

The symptoms of acid intoxication, especially if severe, are characteristic. The essential manifestation is hyperpnea. To the listening ear there is usually appreciable increase in the respiratory excursion with added vesicular quality. The rate is usually increased, but rarely may be decreased. In either instance the character of the breathing is the same. Rales are absent and one is impressed by the fact that there is no cyanosis.

The oxygen is brought to the tissue cells, but fails in part to reach them, finding its way into the venous blood unused. The hyperpnea is a manifestation of the tissue cells call for oxygen. An effort to meet the demand is evidenced in the stimulation of the respiratory centres which bring forward the increased respiratory excursion with usually increased rate in order to produce an exaggerated pulmonary ventilation. The older explanation that the air hunger was due to difference in carbon dioxid content of the blood, which directly acted as a stimulation to the breathing centres, seems less adequate.

The loss of fluid and the intense intoxication are brought out by the intense pallor, the slightly flushed tinged cheeks with a blanched area around the mouth, standing out in contrast to the bright pink lips. The skin assumes a dry ashen-gray color, loses its elasticity, but is free from distinct cyanosis. The eyes are sunken and the fontanels depressed. Later this is replaced by anasarca, when the internal and external respiration is sufficiently embarrassed.

At onset extreme thirst is frequent and may persist, or later, fluids may be refused. Vomiting may be present at onset and may persist throughout the intoxicated stage. If present it is usually of very obstinate type, frequently nothing given by mouth is retained. On the other hand, it may cease to be a symptom in a variable number of hours after onset. The temperature may be high in secondary cases, but in primary cases does not exceed 100° or 101° and may not be abnormal throughout.

At first these infants are extremely restless, tossing from side to side, or if too toxic, merely the extremities are kept in motion. They are exceedingly irritable and resent being disturbed. This is present until the second or stuporous stage is well developed. Stuporous sleep is established in a variable time, usually within twelve to thirty-six hours, and may go on to true coma. However, in some cases extreme restlessness and full consciousness may persist to the end.

In the primary form obstipation is rather the rule, and difficulty is experienced in obtaining satisfactory evacuation.

During the first twenty-four to thirty-six hours, the urine is very scant and there may be anuria. Specimens at this time may be difficult to obtain, even with the catheter. The reaction is acid. There is usually albumin with a varying number of casts. Indican is often in excess and almost regularly there is present a reducing substance. The amount of acetone is variable. Howland and Marriott,[1] in their estimation of beta-oxybutyric and diacetic acids in the blood and acetone bodies in

the urine, have shown that they are of little value in diagnosis; and in certain types of intoxication their variations exclude them as an etiological factor.

The ammonia coefficient is often increased but is of little aid in diagnosis, since it is increased in other intoxications and bears a non-dependable relation to the severity.

It has been our observation especially in the primary form, that there is not infrequently enlargement of the liver to a varying degree, and it may be markedly enlarged. These livers are regularly sensitive to pressure. Acetone odor to the breath and urine is not very uncommon and at times can be detected upon entering the sick room.

Due credit should be given to Thomas D. Parke, of Birmingham, Ala., who, so far as known, was first to recognize and describe these cases under the title of "Intoxication with Acute Degeneration of the Liver." His necropsies brought out the extreme fatty degeneration of the liver, kidneys and other organs.

The carbon dioxid content of the blood and aveolar air is lowered, due probably to the lowered gaseous interchange by the tissue cells. Howland and Marriott's[1] adaptation to infants of the Peasch-Higgins method of estimating alveolar air carbon dioxid tension gives us a means of workable accuracy in estimating at the bedside. The findings are roughly proportional to the severity of the intoxication. There are cases in which the carbon dioxid tension is lowered before symptoms are appreciably in evidence, other cases in which hyperpnea is not strikingly manifest. By checking the carbon dioxid tension we are able to appreciate mild or in some instances developing acid intoxication, and preventive measures may be instituted. It is further practicable by this method of estimation to prognose more accurately, to follow the course of the toxemia, and to check on treatments administered.

The apparatus necessary consists of a mask made from a nipple of a wide-mouthed hygeia nursing bottle. The tip of the nipple is cut away and a connecting glass tube ⅜ inch in diameter is inserted in the opening of the nipple stem. On the lower rim of the nipple a rubber sheet 8 x 10 inches is made secure by rubber cement and adhesive plaster. This is necessary to secure close adaptation of the mask to the face in order that there be no entrance of external air or loss of respired air. A rubber bag of about 500 c. c. capacity is used to collect the alveolar air. By means of an aspirating bulb or hand pump, the bag is filled one-half to two-thirds full of ordinary air, this air being retained in the bag by a pinch-cock on the exit tube. The exit tube is connected with the free end of the glass tube, the mask is adapted closely to the face, including the nose and mouth, the pinch-cock is quickly freed and the baby breathes back and forth into the bag. The adaptation of the mask and the freeing of the pinch-cock is consummated, preferably at the close of expiration, and is to be removed preferably at the end of expiration. The duration of the fixation of the mask is from 28 to 32 seconds. If left on longer than 32 seconds, the reading is too high. The baby should be quiet for at least one minute before the test; on the other hand, crying during the collection of air aids in the gaseous interchange. The reading of the carbon dioxid tension should be taken immediately, as there is rapid diffusions through the rubber container. After the period of 28 to 32 seconds the bag is disconnected and its exit tube is submerged in a test tube, filled with a standard color solution. By pressure on the bag the air is allowed to bubble through the solution until there is no further color change in the standard indicator solution. Then the tube can be removed, the color test tube corked, and compared with the standard color solutions in a series of sealed tubes and the findings read off directly in millimeters. The readings of a normal infant vary from 36 to 45 mm.; in acidosis the reading is constantly lowered and in severe cases may be as low as 14 mm.

The hydrogen ion (that is the acid radical) is greatly increased after the method devised by Levy,[1 10] Rowntree, and Marriott.

Sellard's[10] test for the reaction of blood consists in the evaporation of protein-free alcoholic extract of blood serum to dryness with a few drops of phenolphthalein. Un-

der normal conditions a deep reddish-purple color develops as evaporation proceeds, and the residue is purple and remains so. In the presence of acidosis the color fades, tends to reoccur upon the addition of water, but fails to return in the most severe intoxication. The alteration is taken to be evidence of acidosis, and a marked loss of color seems to indicate a serious loss of alkalies by the blood. A normal reaction can be restored by the administration to the patient of sufficient alkalies (soda bicarbonate).

A study of the oxygen-combining power of the blood shows a decrease in acid intoxication. The low hemoglobin dissociation may be considered as confirmatory. It may be influenced by other factors, as for example by salt concentration. Barcroft[10] has shown that the amount of oxygen combined with hemoglobin when it is saturated with oxygen, at a given low tension, is dependent upon the hydrogen ion concentration in the medium in which the hemoglobin is dissolved. With increasing acidity less oxygen is combined. If a normal blood is exposed to oxygen at a tension of 17 mm. in the absence of carbon dioxid, the hemoglobin is from 70 to 80 % saturated. Under the same conditions in cases of acidosis the hemoglobin may be saturated at 15 to 25 %.

Normally the amount of sodium bicarbonate required to render the urine alkaline is fairly constant, as has been shown by Sellards,[3] Palmer and Henderson. An infant three to twelve months of age requires 1.25 to 3.25 grm. in a single dose to render the urine alkaline; the time required for the change in reaction of the urine varies from 1 to 3 hours. If 1 to 2 grms. is given intravenously the urine reaction becomes alkaline in one-half to one and one-half hours. In acidosis, 3 to 6 grms. intravenously is necessary to produce change in reaction, showing that a distinct tolerance has been acquired.

### TREATMENT

The indication from the laboratory findings is a replenishment of the alkalies and specifically that the alkalies be furnished in the form of bicarbonates. In the method of giving we have four possibilities: it can be given by mouth, by rectum, under the skin, and intravenously.

By the mouth the required dose is large, even a normal infant frequently will not retain so large a dose of sodium bicarbonate. Many cases of acid intoxication, even if there has been no vomiting, do not tend to retain that which is not infrequently rejected by the normal baby. It is ordinarily difficult to give sufficient doses by mouth. It has been our experience that sodium bicarbonate in the concentration of a 5 % solution is not well borne by the rectum, and retention for a sufficient length of time to get the necessary absorption is often not attained. Even a combination of these two routes is often unsatisfactory.

In hypodermoclysis a 2 to 4 % sterile solution is to be used and 100 to 300 c. c. may be given if given slowly. Heated to sterilization sodium bicarbonate is in large part converted into the carbonate which is very irritating, not infrequently giving rise to extensive sloughs. This danger can be minimized by the addition of a few drops of phenolphthalien to the solution and allowing carbon dioxid to bubble slowly through the solution until colorless. This transforms the carbonates back into the bicarbonates. This same procedure can be used for sterile 4 % solution, reconverted by the same procedure, which can be given intravenously in amounts of 75 to 150 c. c., depending upon the size of the infant. In all methods the end in view is to render and maintain the urine alkaline. Two intravenous doses, 2 to 5 grms., of soda bicarbonate per diem should be given, in 2 to 3 hour interval divisions,—that is, small doses.

The amount of alkali in the circulation being directly proportioned to the volume of blood plasma, it follows that an increase of plasma should be followed by an increase in the total alkaline capacity of the blood. Blood transfusions augment the oxygen-carrying capacity and the oxidation ferments. Surely in severe acidosis transfusion is worthy of consideration. During the past two or three years we have used whole blood transfusions in three or four very severe cases with at least very gratifying temporary betterment. Direct transfusion and the giving of citrated blood have been used by others.

Recently Gettler and Lindeman[4] have shown that by the administration of repeated relatively large doses of alkali (sodium bicarbonate) they were able consistently to increase the blood alkalinity—in one instance the actual increase amounted to 74 %. They found that this increase of alkalinity is at its maximum in twenty to forty minutes after the last dose, and that the normal state might be reached within two to four hours. Therefore, the transfusion should be done about thirty minutes after the last dose of alkali.

With a compatible donor, prealkalinized blood apparently offers a very desirable blood for use, and should be decidedly advantageous for selection to replace transfusion of ordinary blood.

With observation of these cases one is impressed with the extreme need for fluids. The supply of fluids by mouth, rectum, or subcutaneously, is essential. If the subcutaneous or intravenous administration of alkali furnishes an insufficient fluid volume, this deficiency should not be overlooked. As to diet in these cases, in infancy we have fairly routinely, when we consider the case ready for diet, used some sugar solution, usually dextromaltose in some form, then cereals, and lastly milks. In cyclic vomiting efforts are made to furnish fluids, then gruels or cereal waters. We are strongly of the belief that in primary acidoses the mortality is lower if feeding is withheld until there is some evidence of beginning recession of the active toxemia.

The blood and carbon dioxid tension may be returned to normal with alkaline treatment; yet in spite of this fact the case not infrequently dies. This possibility may be due to the tissue cells' inability in their devitalized state to again resume their functions. It would seem that a treatment has been found which from a laboratory standpoint seems to readjust the derangement caused by the acid state, yet astounding enough too many of these cases after the correction end fatally. For a number of years we have had to care for more than our share of severe primary acidoses. It has been our custom in these cases to force fluids, make efforts to administer sodium bicarbonate, but to withhold all foods until there is evidence of decrease in the toxemia and the beginning signs of improvement. These evidences are to our mind decreasing hyperpnea, beginning recession of the liver with decreasing tenderness to pressure and readily obtained free evacuation of the bowels. These facts are clear to us, that seemingly the primary cases are more frequent in this climate and that our mortality rate while distinctly high does not approach the death rate which the literature from Northern sections would seem to indicate. A mortality rate of over 90 % in the South is regarded as excessive.

## SUMMARY

It seems established that acids or acid products other than those belonging to the acetone group are important factors in the etiology.

The belief has been expressed that the intoxication of acidosis is due to the loss of alkalies. Since the neutralization or elimination is accomplished to the degree in which a true acid state does not exist, acidosis according to this view would be a state of hypo-alkalinity rather than a state of acid intoxication *per se*.

The laboratory offerings of most value are: the estimation of the hydrogen ion concentration, Sellard's test for the blood reaction, the increased tolerance for alkalies, and the estimation of alveolar air carbon dioxid tension. The last is a practicable bedside procedure and an aid to the diagnosis, degree of severity, and treatment.

A replacement of the fixed body alkalies and a replenishment of the body fluids seems essential in the management.

The introduction of whole or citrated blood has seemed beneficial, but with us a single administration in very severe cases has given only temporary betterment. Prealkalinized blood impresses us as a procedure better than the above methods and well worth consideration.

We are indebted to Howland, Marriott, Sellards and others for their very much clearer descriptions of the state of acidosis, its cause, course, diagnosis and treatment.

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## SOME OBSERVATIONS ON RHEUMATIC FEVER IN CHILDHOOD*

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Investigation of recent years concerning the causation of rheumatic fever renders difficult a definite classification of the disease. That it can be regarded as a specific infection, with all that this term implies, is still open to question. The difficulty of assigning to the disease a definition carrying with it suggestive information as to its character has led to a change in nomenclature and the term "rheumatic fever" has been substituted for the vague and misleading terms "rheumatism," "articular rheumatism" and "inflammatory rheumatism."

As our knowledge of the nature and mode of infection of any disease broadens, there is a tendency to drop generalities and employ terms more suggestive of the nature and location of the malady. But since the symptom complex of rheumatic fever is so varied, differs so much in different individuals and at different periods of life, since it is so much influenced by mode of living, temperament and climatic conditions, and since the causative bacterium itself is subject to morphological and cultural differences under changing conditions, it is at once apparent that an acceptable definition of the disease is difficult of securing.

The vague term "rheumatism" has so long served as a buffer to the insistent demands of the patient for a definite name for his illness, it has so often served as a cloak to conceal our ignorance of certain painful manifestations, that perhaps we lose nothing in divesting the malady of a distinct title.

The applicability of the term "rheumatic fever" is being gradually curtailed by the pathologist, the orthopedist, and the specialist diagnostician, and many of the arthritides of today and cases of focal infection would have been classed as rheumatism a few years ago. Indeed, to some extent, this explains the diminishing number of cases of true rheumatism found today in our various hospitals. But no matter how we differ as to the etiology of rheumatic fever, we must finally look upon the malady, as found in childhood, as materially different from rheumatic fever of adults. Those of us whose knowledge of rheumatic fever is derived from a study of the condition as it exists in adults must revise our opinion of the disease should we attempt to administer to the ills of childhood. The most excellent work of Rosenow has established fairly beyond question the fact that rheumatic fever is due to a streptococcus. More than ten years ago Poynton and Paine had demonstrated to the satisfaction of many that their "diplococcus rheumaticus" was the etiological factor.

This diplococcus fulfilled all of Koch's postulates, and only universal confirmatory evidence was needed for the world to accept the conclusions of these able investigators. But this evidence was especially lacking in this country, and till Rosenow announced the result of his investigations there was not a unanimity of opinion as to the causative bacterium of rheumatic fever.

Unhappily there remains much to be explained concerning the nature of the streptococcus which we now accept as the etiological agent. We know there are several distinct strains of streptococcus differing in morphological and cultural characteristics, and the discovery by Rosenow

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of the transmutation of bacteria has a confirmatory bearing, rather than otherwise, on the original findings of Poynton and Payne. For, as suggested by Dunn, instead of regarding the pneumococcus, streptococcus hemolyticus, diplococcus rheumaticus and streptococcus viridans as distinct strains we must now regard them as one great variety which under different conditions may alter in virulence and pathogenic properties; that each manifestation of streptococcus infection would depend upon the type of streptococcus which had been produced by the conditions which happened to exist. At best we must conclude that several strains of streptococcus produce rheumatic fever.

Having accepted the streptococcus as the offending agent, we are in agreement that the tonsil is the chief portal of entry to the system. That it is the only entry I seriously question, for I have observed presumably primary attacks of rheumatic fever in children whose tonsils had been removed for causes apart from rheumatism. Probably the naso-pharynx and carious teeth must be accepted as being at least occasional portals of entry. Of equal clinical importance as a knowledge of the essential etiological bacterium of rheumatic fever is an understanding of the predisposing causes. There is such agreement among clinicians as to what constitute these causes, and since they are so familiar to all of us, a mention of them is scarcely justified. We must regard heredity as being one of the most striking predisposing causes. It is interesting in this connection to note that Williams believes rheumatism and pulmonary tuberculosis are antagonistic and not active at the same time in the same child; that rheumatism in a parent protects the child in a definite degree from pulmonary tuberculosis.

I find that the age incidence of rheumatic fever is not generally understood, and I am in accord with authorities who suggest that we view with skepticism a ready-made diagnosis of rheumatic fever in children under two years of age. Indeed, it is relatively rare under four years of age, and where there exists a doubt as to the nature of a trouble in a child under four years the preponderance of evidence is against it being rheumatic fever. Between the ages of four and ten we encounter most of the cases in childhood. If these established facts were borne in mind there would be fewer instances of unrecognized scorbutus, infectious arthritis, epiphyseitis and osteo-myelitis.

I have often been assisted in recognizing atypical forms of rheumatic fever by constantly keeping in mind what I shall term the "rheumatic diathesis" of childhood. Those coming under this caption are usually of dark complexion with straight and dark hair; they have abnormally bluish white sclera, especially large central incisors, and exhibit to the most casual observer evidence of a markedly nervous disposition. Such children are usually anemic, and always profoundly so, if recent sufferers from rheumatic fever. They are sometimes edematous, as a result of anemia or cardiac weakness, and their general appearance is somewhat suggestive of hookworm disease. But the pallor is clear white, in contrast to the muddy pallor of children with this latter affection. Moreover, the nervous phenomena exhibited in children with the rheumatic cachexia bear no similarity to the sluggish, unemotional disposition of a child with uncinariasis. Inquiry will develop that such children are usually poor sleepers, often victims of somnambulism and night terrors, are subject to enuresis, habit spasm, frequent attacks of sore throat, tire readily on exertion, complain of gastric pains and are especially subject to the so-called growing pains of childhood. Mothers are insistent that such children are "wormy" and one remedy after another is tried to rid the child of the imaginary parasite. My observation leads me to believe that the child predisposed to erythema and urticaria is likewise predisposed to rheumatic fever. While probably most cases of such skin manifestation have no relationship to the rheumatic diathesis, yet the fact that many such children later on show other evidence of rheumatic fever, and the fact that both conditions are quite responsive to the salicylates, would warrant the assumption that there is an analogy between the conditions hardly to be explained on the theory of coincidence. Still calls attention to

the marked predisposition to rheumatic fever of children with a certain shade of red hair; possibly true, but I have not been able to verify the fact from my own limited observation.

It is a known fact that practically all Negroes claim to have rheumatism. In order to ascertain the susceptibility of the Negro race to true rheumatic fever, I have gone to the pains of writing to most of the Southern hospitals where both white and blacks are treated, inquiring as to the frequency of rheumatic fever in the Negro race. Most of the hospitals had no available data and in giving answer to my inquiry were guided by impressions alone. Many showed a lack of courtesy in failing to reply, while others furnished most desirable statistics. In proportion to the actual number of Negro inmates in hospitals there were a greater number of cases of true rheumatic fever among them than among the whites. This very likely holds true throughout the community. We would expect this increased susceptibility of the Negro to rheumatism in view of his manner of living, poor food, bad hygiene and unusual exposure to debilitating influences of all kind.

Fortunately for the child, the physician recognizes rheumatic fever before the symptom complex is nearly completed and before the rheumatic cachexia is established. The physician who is most apt to make a tardy diagnosis of rheumatic fever is he who regards joint symptoms as an essential manifestation of the disease. I can not too thoroughly impress the fact that, while at one time or another the rheumatic child will likely display evidence of joint involvement, this is by no means necessary, and should be regarded as merely an incident to the course of the malady. Hutchinson aptly remarks that had rheumatic fever been primarily studied in children it would never have been called acute articular rheumatism. In addition to recognizing the protean manifestations of rheumatic fever, we must particularly bear in mind the extreme vulnerability of certain tissues to the action of rheumatic streptococcus. We may thus be able to detect an insidious invasion of this organism before the customary symptoms are displayed and before our patient has sustained irreparable damage. I know of no more reliable danger signal than the so-called growing pains of childhood; trivial in themselves but suggestive to the trained physician of the gravest of possibilities. That these "growing pains" are usually an expression of muscular or fascial rheumatism is universally admitted; and few greater responsibilities devolve upon us than of educating the public as to the significance of such pains. Of more than casual importance is the suggestion of Williams that the "growing pains" of girlhood are more significant than of boyhood. The explanation of course being that the less strenuous life of young girls renders them less prone to pains induced by overexertion and muscle strain.

But while rheumatic fever in childhood may express itself variously all of its manifestations are by comparison but trivial incidents in a malady which finds its gravest and most important expressions in the heart. We must view rheumatic fever of childhood as a general condition with varied manifestations, but with a tendency to cardiac involvement as its chief essential.

We must divest ourselves of the usually accepted idea that it is only the valves of the heart that are primarily affected by rheumatic fever. Every case of rheumatic endocarditis is accompanied by a certain amount of involvement of the myocardium; and Dunn has pointed out that the cardiac symptoms of rheumatic fever in childhood are not due to valvular lesions but to myocarditis, which is the most common rheumatic cardiac lesion in early life. I am sure if this teaching were generally borne in mind our cardiac examinations would consist of something more than the effort with a stethoscope to detect a cardiac murmur.

Just as rheumatic endocarditis practically never exists without a myocarditis so a rheumatic pericarditis is always associated with an endocarditis. For this reason we are justified in viewing the heart manifestations of rheumatic fever as instances of "carditis" in which probably all the heart structures are more or less involved.

In connection with the permanency of

cardiac murmurs of rheumatic origin, I am sure I have seen slight mitral murmurs occurring with primary attacks of rheumatic fever to completely disappear. I am equally positive that these were not instances of mere hemic murmurs.

The general management of rheumatic fever must be influenced by our very inability to detect cardiac lesions in their incipiency. A given case of the disease may be progressing in a manner seemingly satisfactory, yet none of us can state positively that structural damage to the heart is not already in insidious process of development. Then, bearing in mind that an organ at comparative rest is less subject to infection than when fatigued, it is obvious that a prolonged period of rest in bed must be insisted upon for all our children suffering from even slight attacks of rheumatic fever. Certainly in view of the imminent possibility of cardiac involvement any case of rheumatic fever calls for absolute rest for at least two weeks.

This rule is not always easy to enforce, but if the dangers of heart complications are carefully explained to parents in most instances we meet with satisfactory cooperation. I am not one of those who believe that the chief virtue of the salicylates in the treatment of rheumatic fever rests in their anodyne and antipyretic properties. On the other hand, I believe they are possessed of such curative properties as to justify them being regarded as specific. The argument that the salicylates, in failing to relieve cardiac lesions, fall short of specificity, appeals to me as an instance of pure skepticism. We may as well doubt the curative effects of antitoxin for diphtheria merely because it fails to relieve a heart already crippled by toxins. The cardiac complications of rheumatic fever are essentially structural in character and the failure of the salicylates to repair such organic changes is no argument against their specificity. On the other hand, there is a preponderance of evidence to prove that the early exhibition of the salicylates in rheumatic fever tends to reduce the frequency of cardiac complications. In all likelihood certain strains of the streptococcus of rheumatic fever are more resistant to the action of the salicylates than others; for in no other way can we explain the occasional complete failure of the drugs to accomplish expected results. It has been my observation that most of us administer the salicylates in too small doses. As Lees has pointed out, the simultaneous administration of alkalies facilitates the elimination of salicylates and enable us to employ the drug in larger doses than would be otherwise possible. The painstaking work of Rosenow, the statistical data of Dunn and his investigations relative to heart affections incident to rheumatic fever have done much to enhance our knowledge of the disease and to justify a confidence that still greater progress will be made in the near future concerning the nature of the infection and its therapeutic management.

## DISCUSSION

*Dr. William A. Mulherin, Augusta, Ga.*—Dr. Love has brought out quite fully the recently accepted idea of streptococcic infection and the tonsils as the portal of entry. Also Rosenow's experiments with the streptococci, showing that there are many varieties, or strains, included in the streptococcus group, and further showing that the streptococci which cause rheumatic fever have certain peculiar properties. Culturally they differ in various respects from the streptococci associated with the various suppurative processes (the streptococcus hemolyticus) and the streptococcus viridans found in subacute infectious endocarditis. Rosenow's further view of the transmutation of the streptococci is most interesting, for he claims that the virulence of streptococci, and their affinity for various parts of the body, may be altered by certain factors, such as symbiosis with other bacteria and variations in oxygen pressure. The fact that the tonsils are an especially favorable place for the action of such factors is very suggestive. If this theory of Rosenow's, regarding the transmutation of bacteria, can be confirmed, it would give us valuable promises of the successful use of autogenous vaccines in the treatment of rheumatic fever, something very much to be desired.

If there is one thing that deserves to be especially stressed or emphasized in discussing rheumatic fever of childhood, it is the difference that exists between rheumatic fever in children and in adults. So many general practitioners do not recognize this marked difference and overlook many cases of rheumatic fever in children. The two clinical pictures are entirely different. In the adult we are all familiar with a sudden onset of an acute illness; high fever, decided articular symptoms, with exquisitely sensitive joints that are red and swollen, a profuse acid perspiration, delirium not uncommon, with no strong tendency to cardiac involvements. The picture in the child differs from this picture in many ways; for instance, the onset is rather slow, not usually acute, fever moderate or absent, articular manifesta-

tions mildly present in half the cases, absent in about half of the cases, profuse acid perspiration absent, except in older children, delirium absent, cardiac manifestation very frequent and of serious consequences. In Dunn's series of 223 cases, 90 % of these cases showed cardiac involvement.

Another striking point in rheumatic fever in childhood is the many clinical manifestations of this disease. For instance, a child may show only sharp fever with no articular symptoms, and diagnosis can only be made a few days later by cardiac signs and symptoms manifesting themselves. Again, a slight muscular or arthritic pain, to which little attention has been paid, oftentimes called "growing pains," shows its rheumatic origin by cardiac manifestations developing a few days later. Chorea may be another early manifestation, and rheumatic signs and symptoms developing later. Also tonsillitis, pharyngitis and torticollis may all be reckoned at times as clinical manifestations of rheumatic fever. In few words, it is well to get clear in our minds that endocarditis, chorea, rheumatic fever are all one and the same disease with these various manifestations.

If there is one thing we should bear in mind, and for which we should always be on the alert, it is to look sharply to the heart in all cases classed as chorea and acute rheumatic fever, for the cardiac manifestations are the serious conditions in these diseases.

*Dr. John Lovett Morse, Boston, Mass.*—With reference to the heart complications, I wish to say that a book was published thirty years ago by Sturges, of London, called "Acute Carditis of Childhood;" and he has everything in that book that any one else has brought up since then about the involvement of the pericardium, endocardium or myocardium in these cases.

One thing that I wish to emphasize is the importance of rest and quiet in the treatment of rheumatism of childhood so as to avoid, if possible, cardiac complications. If the child has cardiac complications in rheumatism it means at least three months in bed and often more. You are not doing them justice unless you give at least three months' treatment in bed to the patients.

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## IMPORTANT CONSIDERATIONS IN THE DIAGNOSIS AND TREATMENT OF CONTAGIOUS DISEASES*

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There has been relatively little advance in the past year in the diagnosis and treatment of contagious diseases. It is well for us, however, to pause and take stock, to record our position and to determine along what lines progress may be made. The subject is too large to be compassed in the time allowed; therefore, we shall confine our remarks to only a few of the most important ones.

Scarlet fever still remains one of the *betes noires* of the pediatrician. Until we can find some micro-organism which can be agreed upon as the cause of the disease we are handicapped not only in the diagnosis but also in the treatment of this disease, which often runs its own course in spite of our medication. A variety of laboratory aids would be available in our diagnosis and treatment if we only knew what caused an attack of scarlet fever. As it is, we must rely upon a number of symptoms which are inexact. A typically severe form of this disease is hardly likely to be mistaken for any other, but there are many mild cases which are simulated by a number of other diseases which are frequently quite puzzling and quite disconcerting if one has established a rigid quarantine on a wrong diagnosis.

A history of exposure is very valuable in this and the other infectious diseases. In a city negative history is of no value. The onset should be sudden with headache, vomiting, high temperature and a pulse rapid out of all proportion to the temperature. Mild cases may present no sore throat, but there will usually be some reddening of the soft palate. The tip of the tongue will be redder than normal, the papillæ standing up quite scarlet through a whitish furred tongue. The eruption will show on the skin of the neck and chest and will follow a well defined progression over the body in a definite brief time, but sparing a certain area of the face outlined by the chin, nose, and the curving nasal lines. Here the skin will be slightly cream-colored as will also the skin of the body when it has been pressed upon and the blood driven out of the superficial capillaries. The palm of the hand will be redder than normal even before the eruption reaches it, and at the elbow the fine creases which are white normally will be noticeably red. If a tight band be placed around the arm so as to impede the venous return there will appear minute extravasations corresponding to the papillæ involved. Oc-

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casionally the eruption will appear only upon the sacral region or under the axilla or where the skin is especially thin. Under the magnifying glass the exanthem will be seen to be made up of minute scarlet papules surrounded by the creamy-colored skin above noted. In the Negro the eruption is said to be royal purple in color.

Desquamation is a very valuable confirmatory symptom if it is of the branny or scaly type, though one must not forget that desquamation may occur from other than the eruptive diseases and in mild cases it may be overlooked, for sometimes it will be limited to a very small area such as the knee cap or similar small spot. But it will not help us at the time when we most need help, however grateful we may be for the tardy confirmation.

In babies there is great danger of mistaking the easily irritated skin for the severer disease; the various rashes called stomach or teething rashes are sometimes quite puzzling in the presence of a known exposure. One occasionally sees a digestive disturbance that may be characterized by a mild tonsillitis, even with spots upon the surface of the tonsil and with an illy defined rash upon the body. Such cases will clear up at times from a dose of calomel, but one has to reserve one's opinion for a day or more. Indigestion rashes do not come out in the classic area and do not spread with the regularity and uniformity that we expect in scarlet fever. The same may be said of the various dermatites, sunburn, erythemata, infectiosa and others, and the rashes which may appear early in measles, variola, diphtheria or in septic, pyemic or toxic states, or from a number of drugs such as belladonna, antipyrin, iodoform, etc. The typical strawberry tongue is confirmatory, but will not be found in the mildest cases where we are in doubt.

There will be some degree of increased leucocytosis, but the blood picture will not be of any value in differentiation.

The treatment of scarlet fever is symptomatic because we do not know the morbific agent. There have been various sera and vaccines proposed which have had their advocates, but we must remember in this connection the exceeding optimism of physicians with every new drug or remedy suggested. Moser's serum seems to have fairly merited confidence, but there are objections to the use of 200 mils. of serum at a dose, and it is not available at present. Antistreptococcus serum has shown good results in cases in which the tonsillar and pharyngeal inflammation has been very severe and in which the evidences of a mixed infection called for an immunizing aid. One who has had an unfortunate experience with anaphylaxis following injections of sera will be slow to use any about which there is much question. A polyvalent streptococcus vaccine is indicated in the early hours of an attack which by its initial severity forewarns us of a severe anginose complication. It is suggested that such treatment will help prevent the development later of the nephritis which is thought to be caused by the streptococcus infection. It is rational to believe that the nephritis, the pyelitis, the otitis, the adenitis and various other complications and sequelæ are aggravated by, if they are not entirely the result of, this mixed infection. D. M. Lewis has recently claimed to be able to diagnose scarlet fever before the eruption by the presence of a certain type of streptococcus which grows in a peculiarly shaped chain. Whether his findings will be verified or not, there is an almost unanimity of opinion that a streptococcus will be found to be the cause of the disease. So until we do find the real organism we are warranted in using all such agents as have been found to be helpful in streptococcic infections.

A few concrete suggestions are offered as follows: for high temperature, warm packs and aspirin or antipyrin; for the throat, warm douching with mild alkaline antiseptic washes; cold externally, if agreeable, otherwise heat; for delayed eruption, warm packs with hot stimulants internally and much hot water; dilution always of the toxins by the free administration of water and fruit juices with milk and soup from chicken, lamb or veal. Urotropin has not been satisfactory in preventing middle ear disease or nephritis. Certain German writers speak emphatically against the use of Ung. Crede as having no value in reducing the adenitis. The prevention of the nephritis seems to be best accomplished by protecting the body from chilling, by diluting the urine with great quantities of

water, by avoiding such drugs as may injure the kidney cells and especially by arranging a diet during convalescence that shall contain no meat or eggs or other food that shall unduly tax the kidneys during their elimination.

I have not had any experience with dichloramine T, but its oily solution applied locally to nose and throat should be of distinct value.

Our knowledge of pertussis made a distinct advance both in diagnosis and treatment when Bordet and Gengou isolated an organism which is generally accepted as the cause of whooping cough. We have not yet acquired a full knowledge of the organism, so that there is much work to be done before the average practitioner who has not access to a well-equipped laboratory can utilize all its information. The ordinary man will have to make his diagnosis from the symptoms which are present. There are several points upon which one may rest the diagnosis, the most outstanding is the whoop; but one has little advantage over the average grandmother if he must wait for the whoop before diagnosing pertussis. The satisfactory treatment and the prevention of infection to others both require diagnosis before the whoop is heard.

Perhaps the most suggestive symptom in the pertussive stage is the frequency and violence of the night cough. This cough presents another feature which is also helpful in that it comes at regular intervals. If the mother keeps a record of the number of attacks of coughing through the day and night and the time at which these spells occur it will be noted that the spells of coughing will occur at fairly regular intervals and that these intervals will be only about half as long as those recorded in and through the day. In other words, the paroxysms are about twice as frequent at night as during the day. The character of the cough is also peculiar in that the beginning of the cough will be with the full quota of air that is present in the lung. There will be a succession of coughs, each of which takes some of the residual air until the final expulsive effort becomes almost inaudible because there is not enough air left to make much sound. Just at this point inspiration finally is accomplished which later will be merged into a whoop. Another cough which is also quite characteristic is a series of staccato coughs, each made up of two or three expirations, and there will be some eight or ten of these in rapid succession before a pause occurs. During these attacks the face will become reddened and the eyes suffused and the eyelids swollen. Also the child, even if quite young, will always get up or sit up in bed to cough even if the paroxysms are not severe, and older children will run to the mother for help or support. These signs are very evident after the whooping has begun, but I would like to emphasize the fact that they will be observed much earlier if they are looked for and will enable us to make the diagnosis when it is most valuable to us and the patient. Very young babies will frequently pass through an attack of pertussis without ever having whooped.

Enlargement of the tracheobronchial glands has often been described as one of the sequelæ of pertussis and the cause of the severe coughing that frequently lasts so long when the disease has attacked in the early part of the winter, and also to explain the recurrence of a severe paroxysmal cough during the winter following the attack of whooping cough. It has seemed to me that enlargement of these glands could also be made out before the convulsive stage and has enabled me to fortify myself in an early diagnosis. I speak with some hesitancy here because of the difficulty of assuring one's self of the reliability of one's technique, for the X-ray is naturally of no value here and resistance percussion, D'Espine's sign and the other well known diagnostic aids are our only reliance. Coleman has called attention to mild enlargements of the glands which lie along the combined sheath of the carotid and jugular. If the neck is put on the stretch these glands can often be made out. A high leucocytosis is of value in the early stages in differentiating from bronchitis or other diseases that might simulate pertussis.

The treatment of whooping cough has been as various as the experience of the different men has inclined them to one or another line of medication. More recently the vaccine treatment has seemed to give

far more desirable results, especially when aided by drugs. At first the writer used small doses of pertussis vaccine, from ten to twenty millions at a dose, but more recently has increased the initial dose to one hundred millions. With such a dose at the beginning we get much more satisfactory results. It is believed that the persistent hard cough is favored by the mixed infection which always is shown by examination of the sputum. In fact, the Bordet-Gengou bacillus nearly always disappears very early in the whooping stage. It is the writer's habit to use a mixed stock vaccine approaching as nearly as possible the flora found in the particular case. The vaccine is repeated at two or three day intervals until four or more doses have been taken. Amelioration usually begins about the time of the fourth dose. It is not impossible that there may be strains of the pertussis bacillus as distinct as is the case with the pneumococcus, which would lessen the value of stock vaccine treatment.

Probably the most widely accepted medication is a combination of the bromides with antipyrine. The bromide of sodium is preferred on account of being less depressant than the potassium salt. It should be given in five grain doses and the antipyrine in one-half to two grains every two hours. If the cough is tight and severe, there should be added some expectorant as ipecac. Syrup of chestnut leaves, an old-time favorite, may be used as a vehicle. Kerley has made the valuable suggestion that it is well to give this combination for two days and quinin in large doses during the third, thus alternating the treatment. Belladonna is preferred by many, its disagreeable features seem to more than counterbalance its good action. Opiates may be used occasionally at night to secure the much needed relief from exhaustion attendant upon the loss of sleep. These cases, however, are made worse by constipation and better by purgation, so that the opiates have a very limited field of usefulness. Calcium sulphide has proven one of the most dependable drugs in shortening and mitigating the course of the disease. Most of the calcium sulphide on the market being inert and worthless, usually contaminated with calcium sulphate, the doctor should assure himself of the purity of such pills as he prescribes. Its disagreeable taste and difficulty of administration to very young children prove a handicap to its use.

Many drugs and local applications have been advocated by various doctors; in fact, any one line of treatment will give better results in the hands of one who is experienced in that use. The Kilmer belt has been helpful many times when vomiting was severe and again it has been disappointing, as so many appliances have been.

A child should be kept as much as possible in the fresh air; however, it is inadvisable for a child to be unduly exposed; wind and dust as well as rain and snow aggravate the attacks noticeably. It should be remembered that all conditions which tend to bring on or intensify bronchitis will also aggravate a case of pertussis. There is no doubt of the fact that whooping cough cases always do better in the warm, dry summer months; the course of the disease will be shorter and milder. Therefore, it would seem advisable to copy as far as we can summer conditions, particularly if the patient is a delicate, feeble baby, because it is fully appreciated by the pediatrician that such cases afford a very gloomy prognosis.

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## DISCUSSION

*Dr. Frank C. Neff, Kansas City, Mo.*—There are two measures in the handling of scarlet fever that should be emphasized. One is the prophylaxis to the other members of the family by the use of aseptic nursing. You have to think of the possibility that the other children will come down with the disease. If aseptic nursing is of value in institutions, it is also of value in the private home; and the installation of a nurse trained in aseptic nursing would be of value in preventing the spread of the disease to the other members of the family.

Another thing is the use of convalescent serum in scarlet fever. I have tried it during the last two years and am convinced that there is some value in the convalescent human serum. It may be argued that it is difficult to obtain, but quite often it is possible to get it. For instance, if there has been a preceding case of scarlet fever in the same family, and subsequently other children in it come down with the disease, the obtaining of convalescent serum is very easy. The same may be said of hospital cases. If one has in mind the obtaining of this serum, one can usually get a donor who is a proper person to secure blood from. During the last few years I have

seen several cases treated with the serum and have employed it myself, and I believe that there are certain cases in which its use is warranted. In mild cases it is unnecessary, but in the cases that are toxic in the very beginning, before any damage has been done to the kidneys and other organs, there is a distinct field for the convalescent serum. In a few such cases I have seen it produce remarkable results.

*Dr. L. W. Elias, Asheville, N. C.*—One or two points that I wish to make have been made clear by Dr. Pierce, of New York. The rash in scarlet fever comes out on the face, going down the throat, and thence progressing over the body. It differs thus from other rashes, which come out over the whole body at once. A progressive rash is scarlet fever, while one out over the whole body, as thick in one place as in another, is probably not scarlet fever. In nursing, I usually think that the child that escapes scarlet fever after having been exposed to it a week is probably safe. A man whom I have my office with told me of a case in which a baby with scarlet fever nursed its mother. The baby got well, and in six weeks the mother developed the disease. Where the baby got it, no one knows.

There is another thing that the doctor might have stressed as part of the treatment: long rest in bed as a preventive of lesions of the kidneys.

Then, in the discussion of pertussis, I wish that Dr. Barbour had laid more emphasis on fresh air. I am going to find occasion to take measurements of these children. This is rather a hobby of mine, fresh air. It is my "gas treatment." Many mothers claim that when they take their children with whooping cough to the gas house they have less tendency to cough. The explanation of the milder cases in the summer is probably not in the fact that it is warm so much as it is that the children get more fresh air. It seems to me that it is time to emphasize this point: the right of every baby to sleep out of doors the year around. In Asheville it is probably as cold as at any place in the South, and there are not half a dozen days in the year there in which the babies can not sleep out of doors.

*Dr. Hugh Boyd, Scottsboro, Ala.*—There is just one point that I wish to speak of, and that is thoroughness. In scarlet fever the children die either from the malignancy of the infection or from complications, either diphtheria, pneumonia or nephritis. A good many children are carriers of diphtheria. They may carry it for months or years without becoming infected themselves. In private practice I always watch the throat; and if it has suspicious symptoms of a diphtheritic membrane, I examine spreads from it carefully for several days. I have had many severe cases of scarlet fever complicated with diphtheria. I always try to find the bacillus first, but if the throat condition is exceedingly severe I give the antitoxin without waiting for the discovery of the organism and verify it later. But, gentlemen, we should be thorough.

*Dr. Barbour (closing).*—The gas works at home are always surrounded by small children. The mothers sometimes bring home buckets full of the stuff and leave it in the house. They think it does good, and I do not do anything to discourage them in this belief. I do not think it is wholly due to the fresh air, because if the children contract pertussis in the fall they are likely to cough all the winter following.

I have had no experience with convalescent serum. Several authorities speak favorably of it and some equally unfavorably. I did not like to suggest it, because I could not speak authoritatively about it. Personally I am a little loathe to introduce serum into the body, either from the same family or heterologous serum. I have had several cases in which anaphylaxis has been produced, and that scared me.

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## CEREBRAL HEMORRHAGE IN A HEMOPHILIAC—MILK IDIOSYNCRASY—PYLORIC STENOSIS*

By W. W. Harper, M.D.,
Selma, Ala.

CASE I—CEREBRAL HEMORRHAGE IN A HEMOPHILIC

E. S. came under my care when two years old for a persistent hemorrhage from the gums. His family history showed that a maternal uncle had deid of uncontrollable hemorrhage. Father and mother were well and vigorous. He was born naturally at full term and was bottle fed.

Examination showed a well-nourished child and physical examination was negative except for a number of blue spots over his body,—the result of subcutaneous hemorrhages.

The bleeding from the gums was controlled by giving 20 c. c. of horse serum hypodermatically. For a year and a half he took lactate of iron three weeks out of each month. A generous diet was urged, but he was always a delicate, fastidious eater. During these eighteen months he was given at regular intervals three 20 c. c. injections of his mother's serum and three doses of coagulose. Some improvement followed this treatment.

February 26, 1917, the patient (now four years old) had a severe general convulsion. I saw him the next day at 11 A. M. He was very pale, his pulse 124, and he was vomiting. Physical examination was negative except for a complete left motor-hemi-paresis with clonic convulsions of the left hand. The patient was perfectly conscious.

Acting on the suggestion of Dr. Pisek, I decided to give him the father's blood instead of the mother's, as the disease had been transmitted to him by his mother. Six hours after his admission to the hospital he was given 10 c. c. of his father's serum. Five hours later the vomiting ceased.

February 28, 6 P. M., 10 c. c. of father's serum was given.

March 3, 2 A. M., a severe convulsion came on, which lasted a half hour—even though chloro-

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*Read in Section on Pediatrics, Southern Medical Association, Eleventh Annual Meeting, Memphis, Tenn., Nov. 12-15, 1917.

form was used. At 6 A. M., the same day, the patient had a general convulsion of short duration. After recovering consciousness the convulsive movements persisted on the entire left side. For the next forty-eight hours he was given chloral by enema and every eight hours 15 c. c. of whole blood from his father was injected directly into the muscles of his thigh. The effect of this treatment was magical. There were no further general convulsions and gradually the clonic convulsions on the left side disappeared. At the end of forty-eight hours after the last general convulsion, the chloral was discontinued. The blood was given every other day for a week. Then it was given once a week for two months and then every other week for three months. Gradually the paralysis disappeared and by July 1 none was in evidence. Under the use of the father's blood his appetite improved very much and he developed physically quite rapidly.

About August 1, at the suggestion of Dr. John Howland, I put him on kephalin, a brain extract prepared by Dr. W. H. Howell, the Physiologist of the Johns Hopkins University. He has improved more rapidly on this than he did on paternal blood. He takes a pill of this once a day.

CASE II—MILK IDIOSYNCRASY

On December 29, 1915, I was called to treat W. B. for a severe attack of asthma. The patient was eight months old and gave a good family and past history. He had a normal birth and was breast-fed.

Examination showed a well-developed, well-nourished infant. Physical examination was negative except the chest, which was filled with sibilant and sonorous rales. The attack had come on suddenly several hours previous to my visit. The croup-kettle, counter-irritants, enemas, a purgative, emetics and sedative-expectorants had been given, but everything failed to relieve him. He grew steadily worse, became pale, cyanosed and unconscious. Just as he seemed about to die, 1/200 gr. of atropine was given by needle and in fifteen minutes the baby was sitting in his mother's lap playing. No blood examination was made at that time.

Sixteen days later the patient had a second attack of asthma which was worse than the first, and was relieved by atropia and morphia. Blood examination at this time showed no eosinophiles.

March 1, 1916, the baby had a third attack of asthma and was quickly relieved with atropia. Blood examination showed an eosinophilia and a diagnosis of true bronchial asthma was made. Suspecting a protein sensitization, the Schoss test was done and the reaction was to cows' milk. A small amount of cows' milk was given by mouth and an attack of asthma was promptly induced. Goats' milk gave the same reaction. The patient was so sensitive to milk that angio-neurotic edema of the face would be produced if the milk were poured from one vessel to another in his presence. Even biscuits made with milk would give an attack of asthma. By keeping him away from cows' milk and by rigidly excluding milk and butter from his diet, he had no more attacks of asthma.

At the suggestion of Dr. Pisek, of New York, we began in April, 1917, to immunize him against milk. He was now two years old, and on the morning of my visit to give him his initial treatment, I found him playing about the yard. Two drops of sterile milk was given intradermally. In three minutes the baby was in profound shock, pale, sweating and unconscious, and his pulse was thready and irregular. Caffeine ½ gr. and atropia 1/100 gr. revived him in about an hour. Two hours later he had a marked angio-neurotic edema, affecting his face, body and extremities, which persisted for about twenty-four hours. This, the first treatment, was given April 15.

April 22, I gave him one drop of milk by needle with no reaction save swelling and reddening at point of injection.

April 25, he was given two drops of milk by needle and in thirteen minutes he began coughing and wheezing; condition was promptly relieved by hypo. of atropia, 1/200 gr. Fifteen hours later he had another attack of asthma and the arm in which the injection was given swelled from shoulder to hand. Attack was promptly relieved with a dose of tincture of belladonna.

April 28, two drops of milk was given, which caused a reaction in twelve minutes, but this was milder than the previous one.

May 2, three drops of milk; in eight minutes the baby showed a marked systemic reaction.

May 11, two drops of milk; no reaction.

May 15, three drops of milk; in thirty minutes marked reaction.

May 20, three drops of milk; mild reaction—delayed one hour.

May 30, three drops of mlik; mild reaction in one hour.

June 3, four drops of milk; severe reaction in thirty minutes.

July 20, five drops of milk; only reaction was swelling of eyes.

July 27, seven drops; mild reaction.

August 2, nine drops; slight reaction.

August 9, twelve drops; slight reaction.

August 16, fifteen drops; no reaction.

August 23, fifteen drops; no reaction.

September 1, fifteen drops by mouth; no reaction. Milk was increased two drops each day until a teaspoonful was given. It was then rapidly increased and the baby can now take a glassful of milk without any reaction.

His attacks of anaphylaxis were always relieved promptly with atropia. Three or four drops of adrenalin solution would quickly relieve all symptoms, but the effect was transient and had to be followed by atropia to maintain permanent results.

CASE III—PYLORIC STENOSIS

This case is interesting because the patient's sister died from the same condition. C. G. was the second child of healthy parents. He was born naturally, weighed eight pounds, and was breast-fed. Nothing abnormal was noted until the baby was three weeks old, when it had projectile vomiting after each nursing. As the first baby had died from projectile vomiting,—coming on two weeks after birth,—the mother became alarmed when her second baby began having the same kind of vomiting. Three weeks after birth

I was asked to see the baby and diagnosed pyloric stenosis from the classical clinical symptoms,—projectile vomiting, a visible epigastric wave, starvation stools and an oblong tumor over the pylorus. The diagnosis was confirmed by X-ray. An immediate operation was advised and accepted. Twelve hours before the operation milk was discontinued and the patient was given every two hours by mouth two ounces of a 5 % malt-sugar solution. A continuous proctoclysis, ten drops to the minute, of a 15 % glucose and 2 % soda was also begun.

March 2, 1917, under anesthesia, I did a posterior gastroenterostomy. The operation lasted forty minutes and the patient left the table in very good shape. He was placed in the Fowler position and a Murphy drip begun. Five hours after the operation I gave him one dram of sterile water every hour. At the end of twenty-four hours he was given one dram of breast milk and one dram of lime water one hour and one dram of malt sugar solution the next hour.

Baby did well for thirty-six hours,—vomiting only occasionally and very little at a time. At the end of the second day of his operation he began to vomit large quantities of green fluid and was soon looking bad. Gastric lavage gave considerable relief. This was repeated in twelve hours. Frequent enemas soon established normal peristalsis, the baby began to nurse and convalesced very quickly.

November 1, 1917, baby is now 9 months old, weighs twenty-two pounds and is perfectly well.

## DISCUSSION

*Dr. L. T. Royster, Norfolk, Va.*—I think that many children are taken off the breast and eventually allowed to die of starvation just because they are not examined. The child that we examine who vomits mothers' milk habitually should put us on our guard to look for pyloric stenosis. In three instances that have come to our notice lately, the children, at four weeks of age, had vomiting of mothers' milk, and after a week of this the attending physician took the child off the mother's breast and found nothing else agreed with it. The first time the baby was fed in the office it showed a peristaltic wave and a palpable tumor. We should be careful about removing the child from the mother's breast. In our cases, too, the lack of palpable tumor did not rule out stenosis. The Rammstedt operation seemed to give better results than the performance of gastroenterostomy.

*Dr. Harper (closing).*—The case of pyloric stenosis teaches an important lesson,—that in examining a baby the body should be bared of clothing. Last February I had three cases of unrecognized pylorospasm and one case of stenosis. These babies had been taken off the breast and had been unsuccessfully given various milk and artificial food formulas. Thev were under the care of good doctors who "fell down" because they did not undress the patient. As soon as the abdomen was bared the epigastric waves were apparent and a correct diagnosis was easily made.

## *AUTHORS' ABSTRACTS*

### *Medicine*

*The Normal Differential Leucocytic Count as Determined by the Study of 114 Adults.* M. D. Levy, Galveston, Tex. Texas State Journal of Medicine, Vol. XIII, No. 5, September, 1917, p. 179.

The frequent high lymphocyte counts noted in patients entering the medical wards of the Sealy Hospital suggested the possibility of this being a normal count or due to climatic influences. In our studies, the blood of 67 male students in the Medical Department, University of Texas, and 47 nurses in training at the Sealy Hospital, was counted. All were in perfect health and had resided in Galveston for at least six months, and with two exceptions were between 20 and 30 years of age. The stain used was the routine Wright's, 200 cells being counted. The averages from the students were:

| | |
|---|---|
| Polymorphonuclears | 61.2 |
| Eosinophiles | 2.2 |
| Basophiles | .3 |
| Lymphocytes | 34.0 |
| Large mononuclears | 1.1 |
| Transitionals | 1.2 |

The lymphocyte per cent. varied from 17 to 52.2. The nurses' averages were:

| | |
|---|---|
| Polymorphonuclears | 65.7 |
| Eosinophiles | 2.5 |
| Basophiles | 0.1 |
| Lymphocytes | 30.9 |
| Large mononuclears | 0.3 |
| Transitionals | 0.5 |

The lymphocyte per cent. in this group varied from 18.5 to 44.5 %. A slightly lower lymphocyte count is noted in the counts from the nurses, most likely due to the irregular time at which the smears were obtained, those from the students all being obtained during the late forenoon. Combined averages of students and nurses were:

| | |
|---|---|
| Polymorphonuclears | 63.4 |
| Eosinophiles | 2.3 |
| Basophiles | 0.2 |
| Lymphocytes | 32.5 |
| Large mononuclears | 0.7 |
| Transitionals | 0.9 |

That climate has no effect upon the differential counts is shown by the results obtained by Bunting, in Wisconsin, and Cummings, in Los Angeles, their results being practically the same as ours.

#### CONCLUSIONS

1. Latitude has no effect upon the lymphocyte count.

2. The normal lymphocyte count of a healthy adult between the ages of 20 and 30 years is 33 to 34 %, with normal variations as high as 50 %.

3. A lymphocyte count of 30 to 50 %, usually given as occurring in tuberculosis, syphilis and pellagra, is a normal count and of no diagnostic significance.

# TROPICAL DISEASES AND PUBLIC HEALTH

## THE RECENT OUTBREAK OF POLIOMYELITIS IN VIRGINIA*

BY W. A. BRUMFIELD, M.D.,
Richmond, Va.

Records of poliomyelitis in Virginia have been kept in the office of the State Health Department since 1912. It is understood, however, that these figures are only approximately correct, as there are many physicians in the State who do not report the communicable diseases met with in their practice; and it is also very probable that many cases of poliomyelitis have occurred that were not recognized. Under such conditions it is surprising that the number of cases reported each year has not varied more than it has. The lowest number of cases reported is 151 in 1914 and the highest number is 311 in 1916.

Sixty-three deaths were reported from this cause in 1913, when only 246 cases were reported,—a mortality of 26 %. This is a very high mortality for sporadic poliomyelitis, but there are no records of an epidemic in Virginia in 1913, and one or more of these 63 deaths were reported from each of forty of the one hundred and one counties in the State. Twenty-eight counties reported only one death each, and in no county were more than four reported from this cause. The forty counties reporting cases were scattered over the entire State. It is quite probable that the number of deaths from poliomyelitis reported was only a part of what occurred from this disease, as the attention of the medical profession in Virginia had not been especially focused on it in 1913 as it has since.

In 1916, when Virginia quarantined against several of the states north of her, and every newspaper in the State published frequent reports of the New York epidemic and gave front-page space to local cases, the medical profession was naturally looking for and expecting poliomyelitis; yet only 311 cases were reported this year. Twenty-eight of these cases appeared in Lynchburg and its suburbs, with a population of about 40,000, during the months of July and August, and truly constituted a small epidemic.

There was another small epidemic in the eastern part of the State in 1916, but the great majority of the 311 cases reported were widely distributed over the State. A possible indirect connection was established between some of these cases and points in Maryland, Pennsylvania, New Jersey and New York, and they were supposed to have been due to virus brought from these points by "carriers."

In the epidemic of the summer and fall of 1917, 162 cases have been reported. Some of these cases have occurred in each of ten counties, but in two of these there were only 5 and 7 cases each; the connection with the original focus of the epidemic was not at all clear, and, as the disease showed no tendency to spread from them, they have the appearance of several sporadic cases rather than as a part of the epidemic. In two other counties there were cases only in those sections bordering on Rockingham, the first county affected, and in which more than half the cases of the epidemic occurred.

In 82 of the 162 cases the only data obtainable is the reports of physicians to the State Board of Health. In some cases these were merely telegraphic reports, stating the presence and location of cases without giving any details whatever. When such reports were received at the office a card was returned asking for the age, color and sex of the person, with data of onset of disease, history of exposure to other cases, and general sanitary conditions of the home and premises of the family in which the case occurred. Sometimes these cards were not returned, and in other instances not all the questions on them were answered.

Notes on 80 cases were taken by the writer. In most instances the only means of getting information concerning the acute stages of the disease was by asking

*Read in Section on Public Health, Southern Medical Association, Eleventh Annual Meeting, Memphis, Tenn., Nov. 12-15, 1917.

questions of physicians or parents; for, while most of the patients were actually visited, it was often days and sometimes weeks after the acute symptoms had disappeared that opportunity was offered for a personal visit; and in those cases seen early it was practically impossible to make repeated visits to note the progress of symptoms. In taking clinical histories from the attending physician or families leading questions were avoided in order to determine, as far as possible, what symptoms had first and most attracted the attention of parents and physician.

Notes taken in this way on 63 paralytic cases, three of which terminated fatally, and 17 abortive cases read remarkably alike. The usual history was a sudden onset in a previously healthy child. This had its exceptions in a few instances, where the onset was gradual, and in a few others where the child had been delicate. Fever, drowsiness and constipation were almost constant symptoms. Headache was complained of by nearly all patients old enough to express themselves clearly. Nausea and vomiting were very common. Acute pain and tenderness on motion, whether voluntary or involuntary, and on pressure were noted in the majority of cases.

After a few hours or a day or two symptoms of meningeal involvement developed in most of the 80 cases on which personal notes were taken, but there was a considerable number of children in the communities where these were found who recovered with no other symptoms than those of the infectious stage. Some of the children showing only these symptoms were in families with paralytic cases, while in other instances only such cases were found in the family.

The meningeal symptoms noted were pain and stiffness in the neck and spine, with slightly exaggerated reflexes and Kernig's sign. In some cases there was marked retraction of the head and slight arching of the back, amounting to mild opisthotonos. There were cases in which these meningeal symptoms were well marked that recovered without developing paralysis. In all cases as soon as paralysis appeared the reflexes were diminished or lost.

The prominence of the preparalytic symptoms varied greatly. In many cases the symptoms appeared unimportant until paralysis developed. Even in the latter part of the epidemic when the fears of parents were keyed to a very high pitch, the symptoms in some instances were so mild that little attention was given them until the development of paralysis. The great excitement and alarm caused by the epidemic and the efforts instituted for its control were often themselves responsible for these mild symptoms being ignored; it was impossible for the parents to believe that a disease that was upsetting the whole business and social life of a large section of the State could begin and run its course with such insignificant symptoms.

In a general way severity of onset and acute symptoms pointed to a serious prognosis, but this rule had its exceptions as the two following cases illustrate:

M. D., female, age 6, was taken ill with indefinite symptoms on June 24,—malaise, low fever, restlessness and constipation. The child did not remain in bed, but lay down most of the time until the morning of June 27, when great difficulty of respiration developed and the patient died in the afternoon.

C. K., male, age 3. Sudden onset August 13; complained of "pain in stomach" (nausea?); very drowsy, high fever, violent twitching of muscles, convulsion in afternoon, slgiht but distinct stiffness of neck with marked Kernig's sign; reflexes apparently slightly reduced. All of these symptoms were very pronounced within three hours after onset of illness. In two days he was up and apparently well, but the external rectus muscle of the left eye was paralyzed, giving an extreme internal squint to the eye.

Convulsions occurred in three cases and retention of urine in three. The latter was overlooked in a fourteen-year-old girl until incontinence of retention had been present for a day or two.

While these symptoms varied widely in individual cases, all the physicians who had seen several cases felt warranted in making a diagnosis in many instances before the onset of paralysis; and they never doubted their opinion when the symptom-complex was complete in the acute stage, even though paralysis never developed.

In sixty-four cases the distribution of the paralysis was noted. Careful examinations would probably have given a larger number of combinations and fewer arms,

legs, and face alone, as it is doubted that milder paralysis was noted, or even detected when muscles of the trunk were involved. However, the following figures are correct as far as the more pronounced paralyses are concerned:

| | Cases |
|---|---|
| Face (one side and no other involvement) | 8 |
| Face and leg | 1 |
| External rectus of eye (abducens) | 2 |
| Ascending | 3 |
| Shoulder or arm, only | 6 |
| One or both legs, only | 29 |
| Legs and arms | 8 |
| Neck and back muscles | 7 |
| | 64 |

There were, however, many cases, some of a very mild and others of a fatal type, in which the diagnosis was not at all clear; and there is evidence that many mistakes were made. From the personal notes of the writer used for statistical purposes, all cases in which there was no definite paralysis are excluded unless other indications were sufficiently characteristic to warrant the diagnosis. In this way more than fifty cases that might have been classed as suspected abortive cases have been thrown out. These were generally children in families where there were definite paralytic cases, and if they were included the number of instances in which two, three and more cases occurred in the same family would have been quite as high as it usually is in epidemics of diphtheria or scarlet fever.

The records of the Bureau of Vital Statistics furnish very strong evidence that some fatal cases of poliomyelitis were not properly diagnosed. Death certificates from the county which had more than half the cases in the epidemic show that two children of the same family,—one three years and two months old and the other one year and nine months old,—were taken sick on succeeding days and died after illnesses of nine days and five days, respectively, from "acute septic gastro-enteritis;" another child three years and eight months old died after an illness of one day from "ptomaine poisoning from eating Bologna sausage;" and a fourth child of eighteen months died after being sick two days from "toxemia of the bowels." Further evidence in this direction is furnished by the following table, which shows the number of deaths recorded in white children between the ages of two months and fifteen years in Rockingham County in June, July and August of the three preceding years and this, the year of the epidemic:

| Year | Month | 2 mos. to 1 yr | 1 yr to 5 yrs | 5 to 10 years | 10 to 15 years | Total |
|---|---|---|---|---|---|---|
| 1914 | June | 1 | 1 | 0 | 0 | 2 |
| | July | 4 | 2 | 0 | 2 | 8 |
| | August | 2 | 2 | 0 | 0 | 4—14 |
| | | 7 | 5 | 0 | 2 | |
| 1915 | June | 2 | 0 | 0 | 0 | 8 |
| | July | 0 | 4 | 1 | 0 | 5 |
| | August | 1 | 1 | 1 | 0 | 3—10 |
| | | 3 | 5 | 2 | 0 | |
| 1916 | June | 7 | 2 | 0 | 0 | 9 |
| | July | 4 | 1 | 1 | 1 | 7 |
| | August | 2 | 3 | 0 | 1 | 6—22 |
| | | 13 | 6 | 1 | 2 | |
| 1917 | June | 0 | 3 | 3 | 0 | 6 |
| | July | 3 | 11 | 0 | 1 | 15 |
| | August | 4 | 11 | 3 | 0 | 18—39 |
| | | 7 | 25 | 6 | 1 | 85 |

Some deaths from poliomyelitis in this county have also been reported for September of this year, but this month is not included because the complete records for it are not yet available.

As sixteen deaths in this age group reported in these months in 1917 were from poliomyelitis, this table shows only 3 more deaths from causes other than this for these months of this year than occurred in the same months of 1916, in which the number of deaths was greatly in excess of those for either of the preceding years. Comparing the figures in this table for children 1 to 15 years, the difference is very much more striking. These figures show for 1914 seven deaths, for 1915 seven deaths, for 1916 nine deaths, and for 1917 thirty-two deaths. Here are 23 more deaths in children between 1 and 15 years in 1917 than for the next highest of the three preceding years—1916. Fifteen of these 23 deaths are accounted for by reported cases of poliomyelitis. Besides these there are 8 more deaths for children

of these ages in 1917 than in 1916. There was no epidemic of any disease other than poliomyelitis nor any excess of sickness of any other character to account for over 88 % more deaths in children of these ages in 1917 than in any of the three past years. The writer believes this excess is due to unrecognized fatal cases of poliomyelitis.

As explained above, it is not known just how many of these 162 cases were of the paralytic and how many of the abortive type. It is believed, however, that the great majority of them were of the paralytic type because most of the physicians were inclined to positively diagnose and report only cases with well developed paralysis. There were 25 deaths in this series, a mortality of 15.4 % for the whole epidemic. Seventy-seven of the 162 cases and 17 of the 25 deaths occurred in Rockingham County, where the original focus of the disease was found. This is a case rate of 2.2 per 1,000 of population and a mortality of 22 % of the cases in this county. The case mortality was notably higher in the beginning of the epidemic than it was later. This may probably be explained in part by many mild cases being recognized and reported in the latter part of the epidemic which would have escaped detection earlier in its course, when the physicians were not on the lookout for the disease nor so familiar with its symptoms. Of the first 14 cases, including 2 of a very mild type, with only slight paralysis and complete recovery after a few weeks, no less than 7, or 50 %, died. Only 53 of the 162 cases occurred before the first of August, while 12 of the 25 deaths occurred before this date, a mortality slightly over 22 %; in the 109 cases reported after August 1, only 13, or slightly over 12 %, died.

### EPIDEMIOLOGY

Four deaths were reported from Rockingham County in 1913. In 1916 there was one case reported in March and one in April by the physician at McGaheysville, near where the epidemic of this year started. In April of 1917 another case was reported in this community. Does this indicate the presence of a carrier or have these cases any relation to the epidemic which began here nearly three months later? On July 24 one case developed near McGaheysville and another at Elkton, about five miles away. Other cases began in this same neighborhood on June 30 and July 1. Cases continued to develop in the little town of Elkton, with a population of only 500, and its vicinity until July 25, when the sixteenth and last case was reported. All of these cases had developed before any preventive measures were instituted, and, indeed, before it was recognized that an epidemic was present.

Grottoes was the second focus in this epidemic. This town, with a population of about 600, is also in Rockingham County, seventeen miles south of Elkton and connected with it by the Norfolk and Western Railroad. The first case to develop here had its onset July 11, and from this date other cases continued to develop at intervals of a few days until August 10, by which time 9 definite and 3 probable cases were recorded,—2 % of the total population of the town. One of these cases terminated fatally.

No definite direct nor indirect contact could be established between any case in Grottoes and any case in Elkton, but there is frequent passing to and fro between these places. In Grottoes, as in Elkton, practically no preventive measures were instituted and the victims here may have been indirectly exposed through a third person, or directly exposed to cases in the incubation period.

Several cases developed on highways leading from Grottoes in a way to indicate that this was the source of their infection.

A third town in Rockingham County to record several cases was Harrisonburg, the county seat, with a population of about 6,000. It also is directly connected with Elkton by rail and macadam roads. The first case that appeared here was on July 20. The victim was a girl six years old, and ten days later her four-year-old brother was attacked. Between these dates three other cases had developed.

Preventive measures had been instituted here before the first case was reported, but they were never efficiently applied. Twelve cases—the last on September 15—finally developed in this town before the end of the epidemic. No death

from poliomyelitis occurred in Harrisonburg. The other cases in Rockingham were scattered almost throughout the County.

Ten scattered cases with 2 deaths occurred near the Norfolk and Western Railroad, twenty-five miles north of Elkton in Page County. There were two towns in this County each with about 1,500 population—one six and the other twenty-six miles north of Elkton, and directly connected with it by the Norfolk and Western Railroad, neither of which reported a single case; but Front Royal, twenty-four miles further away on the same railroad, had 9 cases with 1 death.

The most interesting secondary focus in this epidemic was about Sperryville, in Rappahannock County. This little village is far from any railroad and about forty-five miles from Elkton, but some families had moved from here to Elkton to work in a tannery. They had left numerous relatives in their native neighborhood, and visiting is frequent between the two places. The first case to develop in this community had its onset July 12 with only slight fever and drowsiness. These symptoms persisted and increased until July 19, when a physician was called. On the morning of the 20th the child was apparently much better, but the abductors and biceps of the left arm were completely paralyzed. The second case in this community was taken sick on the 17th and paralyzed in the legs on the 20th. No physician was called in this case, but a few days later when one was passing the home while the little girl was lying on a cot in the yard, the mother asked the doctor why she could not walk. Two other cases—one near each of these—developed on July 22. All of these were paralytic cases. The Board of Supervisors now met and passed a rule requiring all children under 16 years of age to remain on their own premises and stopping all public gatherings among adults. There had, however, already been a very general commingling of the people in this immediate community and a lawn party held on the night of the 14th of July had attracted some children from a town a few miles distant. One of these, a physician's son eleven years old, developed poliomyelitis nine days later and he will be crippled in both legs and the left arm the rest of his life. His father had seen no cases of the disease and there was none in his neighborhood, but there were some children at the lawn party who were known to have been exposed to suspected cases in Sperryville. Within two more weeks there were 29 other sick children in this community. Most of the families in which these cases occurred were nearly related, as is often the case with people in mountain settlements, and there had been very general visiting among all of them. Of these 29 children only 5 were left with any paralysis, but there was absolutely no doubt in the mind of the physician who saw most of them nor in the minds of the parents of the children that all were suffering from the same malady. In each of two families there were three children suffering with all the symptoms of so-called abortive poliomyelitis. A child in one of these families was left with a slight facial paralysis which cleared up completely within a few weeks, and one child in the other family was left with a group of muscles in the back so weak that it was very difficult for him to rise to a sitting posture. A third family in the same community had 3 children sick with the same symptoms, none of whom was left with any paralysis. Four other families at Sperryville each had 2 children sick with these symptoms. One of these 6 children, Miss V. W., an overgrown girl of sixteen years, was left seriously crippled for weeks with soreness and weakness of the spine and the abductor muscles of the thighs. This patient was a guest in the home of Mr. Thomas A. on July 22, when his seven-year-old son developed high fever, drowsiness, vomiting, constipation, marked tremor and jerking and twitching of muscles in sleep. These symptoms persisted for three days, when a slight squint was observed in one eye and persisted for a week or two. Being over sixteen years old, Miss V. W. was permitted to go at liberty and on July 23 she visited a young lady at Washington, Va. This young lady had a five-year-old nephew from Washington, D. C., visiting her at this time. Miss V. W. was entertained on the porch and the little nephew did not go out of the

house while she was there. Two days after the visit, July 25, Miss V. W. developed poliomyelitis, and fifteen days after this visit the little boy was attacked. He had very little fever, some drowsiness and constipation, but was so slightly ill that a physician was not called to see him. After a few days it was noticed that his legs were weak; he walked awkwardly and fell several times. His grandmother sent for a physician, saying that she feared the little boy's knee cap was dislocated. The doctor found the patient playing on the porch and did not detect any trouble with him. A few days later the little fellow wished to return to his home in Washington, D. C. To pass the tollgate between him and the station required a physician's certificate that there was no danger of his spreading poliomyelitis. This certificate was readily obtained from the physician who had seen him and he was taken nearly one hundred miles on the train to Washington, D. C., where a diagnosis of poliomyelitis, with almost complete paralysis of both legs, was made a few days after his arrival. This case was one of progressive, or Landry's paralysis, and it serves to emphasize the absurdity of relying upon physicians' certificates in attempting to control this disease.

Green is one of the most isolated counties in Virginia. It is situated in the Blue Ridge Mountains several miles from any railroad. It is connected with Rockingham County by three roads through gaps or passes in the mountains. An important industry in the more mountainous sections of the County is gathering bark for tanning purposes. From the western part of the county, where most of the cases of poliomyelitis were found, the bark is hauled to Elkton for sale. In some instances it was found that the fathers of patients in this section had been to Elkton to take loads of bark. These men would usually go into a few stores in the two or three hours spent in the town, but there was no known contact of a father with a case of poliomyelitis, and in no instance did the father himself contract the disease in recognized form. Here, as in Rappahannock County, three and four children in the same family were often sick with the same symptoms when possibly one or none would develop definite paralysis. The first case discovered in this County had its onset July 12. Nineteen more cases and 2 deaths were reported in the course of the epidemic.

Madison County is situated between Rappahannock and Green Counties and is of the same mountainous character. It is practically cut off from Rockingham and other valley counties by the Blue Ridge Mountains, and there is but little communication between it and Rappahannock to the north and Green to the south. It was nearly two months after the disease appeared in these adjacent counties before the first case was found in Madison on September 2. This was one of 11 cases, with 1 death, that occurred within a few miles of one another in a thinly settled mountainous district in this County.

As is usual in rural districts, the age incidence is somewhat higher than in towns and cities. The oldest case in this list was twenty-seven years; the youngest four and a half months.

The age incidence in 129 cases of this epidemic is given in the following table:

| Under 5 yrs | 5-10 | 10-15 | 15-20 | Over 20 |
|---|---|---|---|---|
| 66 cases | 43 cases | 9 cases | 5 cases | 6 cases |
| 51 % | 33 % | 7 % | 4 % | 4.6 % |

The number of families in which more than one case was reported was eight. If the cases without paralysis or other symptoms sufficiently characteristic to warrant a definite diagnosis, but which, on account of association with known cases, as well as the symptoms exhibited, are believed to have been poliomyelitis, had been included, the number of multiple cases in a family would be greatly increased.

Measures for the control of the epidemic were based upon the theory that the virus may be disseminated by "contact" with recognized or unrecognized cases or healthy carriers; and by flies from the discharges of patients or carriers. It was assumed that any person in the affected district, without regard to age, was a possible "carrier," and every case of acute illness in which the cause was not absolutely clear was regarded as possibly due to the virus of poliomyelitis.

The State laws of Virginia require the isolation of patients and quarantine of all members of their families under sixteen years of age, with certain restrictions on any adult members of their families whose

occupations bring them into close contact with children or require the handling of foods. The local authorities conscientiously attempted to enforce these laws and passed other rules requiring the closing of motion picture shows, churches, and Sunday schools and all other public gatherings that were not absolutely necessary. In addition to these measures people were urged to avoid all but necessary business intercourse, and to keep their families in their homes. Sanitary privies and screening of doors and windows were insisted upon.

Such radical measures as these, when applied throughout whole counties, necessarily seriously upset the business and social life of all the people. Two or three members of the medical profession in one county publicly expressed the opinion that the prevalence of the disease was greatly exaggerated and that preventive measures were futile and unnecessary. One doctor wrote a long article which was published by a local paper giving the "Truth About Infantile Paralysis," and disagreeing with all the national, state and local health officers. Some lines of business suffered serious losses for two or three months and a few of the business men opposed the measures adopted on these grounds.

With a large number of separate communities and several independent local governments it was only natural that there should have been great differences in the efficiency of the application of preventive measures. Whenever, too, several days elapsed without the development of a new case near a given community there was apt to be a general relaxation until another case was reported. It has been impossible to form a very definite opinion on the value of these preventive measures as applied in this epidemic, but there is evidence to indicate that if nothing had been done the number of cases would have been larger.

Certainly in those foci of infection in the beginning of the epidemic where no effort was made to limit its spread, the case rate was much higher than it was elsewhere,—being about 2 % in Elkton and Grottoes. In those communities in which these measures were rigidly applied, the duration of the epidemic was shorter than it was where there was alternate laxity and rigor in enforcing them. In Harrisonburg no case of poliomyelitis having been reported from August 23 until September 10, restrictive measures were abrogated. Immediately the children made the most of their freedom to visit one another and on September 13 and 15, respectively, two other children went down with the disease. These children were cousins and were together much of the day of September 10. It is quite probable that they received their infection from the same source, and if they had been kept in their homes a few days longer they would have escaped it altogether.

## CONCLUSIONS

The name infantile paralysis should be dropped entirely as a name for this disease because it conveys the idea that only infants are attacked and that all cases result in paralysis. Poliomyelitis is a much better name, because it indicates the nature of the disease and does not necessarily convey the idea of paralysis.

In this epidemic there were a large number of children suffering from very mild symptoms which were due to infection with the virus of poliomyelitis. Some of these children were so slightly ill that no physician was called to see them.

We can not make a positive diagnosis of typhoid fever without a Widal, or of diphtheria without finding the bacillus, or of malaria without a blood examination, and we can not make a diagnosis of poliomyelitis without a spinal puncture, unless and until the paralysis develops. However, where you have a number of children related as these children were and associated together as they had been, it is ridiculous to refuse to make a diagnosis of poliomyelitis because no paralysis exists.

But few cases in this epidemic were contracted from recognized cases. Unrecognized mild cases may have been largely responsible for the spread of the disease and it was very difficult to control the mild cases in which there was no paralysis, and their attendants because they were not willing to accept the diagnosis.

It is probable that most of the cases in this epidemic received the infection from the fathers who, themselves, showed no symptoms of the disease.

# SURGERY

## WAR, RAILWAY, INDUSTRIAL, GYNECOLOGICAL, OBSTETRICAL AND UROLOGICAL.

### ORGANIZATION OF A HOSPITAL FOR THE TREATMENT OF FRACTURES*

By John B. Walker, MD.,
Major, M.R.C.,
*and*
Claude C. Cody, Jr., M.D.,
Captain, M.R.C.,
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Washington, D. C.

The first hospital adapted to the special treatment of fractures is now being organized with one thousand beds. The hospital will be built on the unit pavilion basis, thoroughly supplied with modern equipment, and located somewhere in France. To this hospital it is intended to move the more serious cases of fracture of the bones of the extremities, especially those of the femur and humerus. In the organization of this hospital it is proposed to have the personnel composed of skilled surgeons who have devoted particular attention to the treatment of fractures.

From the published reports of observers on the various battle fronts in Europe, it is now possible to estimate before any given battle the number of men who will be wounded, and to approximate the percentage of injuries to the abdomen, chest, head, and extremities with an accuracy sufficient for our needs. Wounds of the extremities occur much more frequently than wounds of the chest, abdomen, and head. In fact, their incidence is even greater than all of these combined. Fractures should therefore immediately assume one of the most important positions in any discussion of military surgery, both on account of the relatively enormous number which occur, and the probability of preventable bad results following inadequate treatment. It is indeed fortunate that in no class of cases does early and adequate surgery yield such excellent results from treatment as do fractures. The converse of this proposition is equally true, that in no class of cases does delay, conflicting treatments and inadequate surgery exact such a toll in the form of avoidable death, preventable disfigurement, and unnecessary permanent disability as in fractures received on the battle field.

In working out the plans for a special fracture hospital, attention has not been confined merely to the buildings and methods to be pursued therein; but the problem has been taken up from the beginning. No treatment for fractures can be satisfactory which ignores the methods pursued before the wounded soldier enters the hospital. The treatment must be so systematized that the soldier will be under one method from the time he is injured until he leaves the hospital. This is the only rational procedure, and haphazard methods can only result in inevitable disappointments.

In order to make this plan effective, two things must be accomplished: first, the adoption of a standard method of treatment; and second, training each surgeon in the use of the standard appliances, and giving him a definite realization of the part he is to play in the treatment of fractures. The latter is the more formidable of the two, and is already in the process of accomplishment by the establishment of intensive courses of instruction in standard methods for the treatment of fractures.

The purpose of this course of instruction is to familiarize medical officers with standard methods in the treatment of fractures. It is intended that officers so trained will not only serve in the special fracture hospital, but in field, base and general hospitals, and as regimental officers as well, so that a continuity in the

*Read by title, Section on Surgery, Southern Medical Association, Eleventh Annual Meeting, Memphis, Tenn., Nov. 12-15, 1917.

methods for treating fractures can be maintained. By this means it is proposed to establish team work on the part of medical officers throughout the Army in order that the wounded soldier will receive promptly the most efficient treatment whether at the regimental aid station, the dressing station, the field hospital, the evacuating hospital, or the base hospital, as well as along the lines of transportation. The logical result of this co-operation will be to secure early recovery, lessen deformity, and reduce the number of soldiers permanently disabled to a minimum. It is realized that the exigencies of the service in the zone of the advance will frequently be such as to render the standard methods impracticable, but by indicating clearly the *desideratum* it is hoped that the difficulties in the field will act not so much as an obstacle as a stimulus to the ingenuity of the medical officers.

Nearly all fractures in war are compound, so that any treatment which considers merely the fracture and not the wound and the soldier would be quite ineffective. Consequently, the course of instruction will be initiated with a brief but thorough presentation of wounds, from a military standpoint, their causes, and their treatment. This will be followed by the course in standard methods for treating fractures proper. The instruction will be intensely practical in nature, consisting in the demonstration of the splints, their adaptability and application, and in clinics.

The instructors, who are all eminent surgeons, have been supplied with an outline of the course to be presented so that uniformity of instruction is assured. It is intended that the medical officers on the completion of the course will return to their several camps and thus become a focus of information on the standard methods for the treatment of fractures. In this way, the practical methods of technic will be very rapidly disseminated among the medical officers.

A paper such as this is manifestly inadequate for the proper presentation of the splints which have been adopted as standard, or to enter into a detailed discussion of their points of superiority; but suffice it to say that they have proven their position under the conditions that we will be called upon shortly to face. Too much emphasis can not be placed upon early and adequate surgery in the treatment for fractures. Only the shortest possible time should be allowed to elapse from the time the fracture occurs until adequate extension, reduction, and wound antisepsis is inaugurated in order to protect the integrity of the muscle, lessen the nerve trauma and the pain, and promote early healing. The simple statement of the proposition is so self-evident that it is the proof. Too much emphasis can not be placed upon early and adequate surgery. Consequently, it is insisted that standard methods be inaugurated just as close to the firing lines as is practicable, and that they be maintained along the lines of transportation in order that the patient reach the hospitals in the very best possible condition. The advantages of such an organization for the special treatment of fractures is quite evident from a military, economic and surgical standpoint.

## IMPROVED TECHNIC FOR REPAIR OF INGUINAL HERNIA*

By Marshall J. Payne, M.D.,
Staunton, Va.

In employing an improved technic for the repair of inguinal hernia, the author adopts in the main the essential principles of the original Bassini operation, the steps of which are here given in detail only for your convenience in study and comparison. It is desired that proper credit be here given to the author of the Bassini operation for the excellent and scientific operation that he originated.

### BASSINI'S OPERATION

(1) An incision is made parallel to, and well above, Poupart's ligament. It begins lateral or external to the region of the internal abdominal ring, and ends medial to the external ring.

(2) A firm aponeurotic sheet (aponeurosis of external oblique) covering the hernia is exposed and divided in the direction

*Read by title, Southern States Association of Railway Surgeons, Auxiliary of Southern Medical Association, Memphis, Tenn., Nov. 12, 1917.

of the wound. Thus are formed a superior and inferior aponeurotic flap. The superior flap is separated from the subjacent tissues for a distance of 1 or 1½ inches.

(3) The hernial sac now lies exposed from its peritoneal origin to the point where it disappears into the scrotum. The sac is separated from its surroundings and from the spermatic cords. This must be done thoroughly and carefully. The sac should be opened and its contents reduced or properly treated.

(4) Traction being exerted upon the sac, its neck is transfixed and ligated as high up as possible, and the distal portion cut off. The neck of the sac may be sewed up and the distal portion removed. By whatever method the neck is closed and divided, special attention ought to be paid to the position of the spermatic cord, as this important structure has frequently been injured. Separation of the sac from its surroundings has freshened all the tissues so that if placed in apposition they will unite.

(5) The spermatic cord is raised from its bed and held out of the way. A review of the wound now shows that its upper edge consists of three layers: (A) A deep, thick layer, the muscular flap (composed of the internal oblique and transversalis muscles, transversalis fascia, and lateral margin of the rectus). (B) Superior aponeurotic flap (composed of the aponeurosis of the external oblique). (C) the skin. The lower edge of the wound consists of the deep layer of Poupart's ligament on which the spermatic cord normally lies, the inferior aponeurotic flap, and the skin.

(6) A suture is now passed through the muscular flap, close to the exit of the cord from the abdomen, and unites it to the deeper layer of Poupart's ligament. This suture must be so placed as to close the wound beside the cord, yet not to interfere with its circulation. Some surgeons place a suture external to the cord. Hold the cord vertical, pass a needle close to the side of the cord. (This is considered important.) The whole edge of the muscular flap is stitched to the deep layer of Poupart's ligament, preferably by interrupted sutures.

(7) The cord is now laid on the top of the line of the sutures, and in the Bassini operation the aponeurotic flaps are then united over the cord.

### AUTHOR'S MODIFICATION

(1) In the modification proposed the cord is laid on top of the line of sutures in the deep layer of Poupart's ligament, and the inferior aponeurotic flap is then united to the muscular flap of the internal, oblique and transversalis muscles, to the external margin of the rectus and conjoined tendon (preferably by interrupted sutures), observing special care in placing the suture to make some tension on the inferior aponeurotic flap, in order that a relaxation of the tension on the deep suture line may be obtained.

(2) The superior aponeurotic flap is now united to the anterior surface of the inferior aponeurotic flap, giving a wide area of approximation.

(3) The fascia, fat and skin are united.

### CONCLUSIONS

It is believed that the improved technic in principle and effect accomplishes:

(1) A relaxation of tension on the line of sutures, apposing the muscular structures to Poupart's ligament. The principle is that of a "guy rope."

(2) It allows a wider and easier approximation of tissue.

(3) It implants an additional layer of tissue in front of the deep ring.

(4) It furnishes a more convenient source of obtaining fascial support than flaps taken from the rectus sheath.

(5) The relaxation of tension on the structures is more easily and more certainly accomplished.

(6) It lessens pressure upon the spermatic cord, a frequent cause of discomfort after operations for hernia.

(7) The relaxation of the tension on the deep suture line allows the regeneration of tissue to be more certain and, therefore, the union between the parts is more capable of resisting the effects of immediate and remote strain.

(8) The special feature of the modification suggested is a reinforcement of the wound, by uniting the lower aponeurotic flap to the deep or muscular structures.

In addition to this special feature, the

various structures brought into apposition are more readily overlapped, at the same time relaxation of tension on the most important suture line is easily accomplished.

## A PIECE OF STEEL IN THE BRAIN EIGHTEEN YEARS

By S. H. McLean, M.D., F.A.C.S.,
Jackson, Miss.

October 27, 1915, Miss W. came to see me, accompanied by her mother, with the following history:

When five years of age she was preparing to attend an entertainment in the neighborhood, and on getting into the vehicle she switched the horse's tail, and in return received a kick in the head, causing a depressed fracture. They sent for a physician twelve miles away, and he arrived near midnight; took the child into the kitchen, and with all the coal oil lights available began to attempt to raise the skull. The mother remarked to the doctor, "You have broken off your knife," to which he replied, "Yes, but it must have fallen on the floor." But it was never found. After a rather stormy recovery of about six weeks, the child was able to be about and gradually regained her normal health, but with a considerable depression in the skull at the edge of the hair. This happened when she was five years old and gave no trouble until she was twenty-three years old, or eighteen years afterward, when she began to have a few headaches and a little tenderness over the depressed area and slight twitching in the foot and leg, which grew rapidly worse in the next few months. She is a school teacher and said she would have to give up her occupation unless something could be done, as she could not keep her foot still in the school room, and it lessened her capacity as a teacher, as it attracted the attention of the pupils. Her mother said we have always believed there was a knife blade in her brain. I paid very little attention to this, but told her I thought the twitching was due to the depressed bone pressing upon the brain, resulting from the injury, and that perhaps removing the bone would relieve the condition.

I operated the following day over the center of the depression, removing with a trepan a button a little less than the size of a half dollar, turning the flap of skin and fascia from above downward so as to place the scar of the incision in the hair. On removing the bone, the mother standing by the side of the daughter, said, "There it is," which greatly surprised me. Instead of a knife blade, it was a blade of a large pair of forceps, two and a half inches in length, lying between the dura and skull. It may have been polished at the time of entrance, but it now was like a piece of steel with no polish.

She left the Baptist Hospital on the eighth day free from any twitching or pain. This was in October, 1915. I saw her a short time ago,—now a little over two years since operation,—and found her in perfect health and carrying on her vocation as usual.

I am reporting this merely as a curiosity,—a piece of steel remaining in contact with the brain for eighteen years and giving no trouble until a few months prior to operation.

## *AUTHORS' ABSTRACTS*

### *Surgery*

*New Growths of the Mediastinum, with Special Reference to Their Treatment with Radium.* Curtis F. Burnam, Baltimore, Md. The Journal of the American Medical Association, Vol. LXIX, No. 12, September 22, 1917, p. 989.

So far as the author has been able to ascertain, there has never been a surgical case of a malignant mediastinal tumor. Several cases of great improvement or cure through roentgen-ray treatments are, however, on record.

In the eight cases of mediastinal tumor reported in detail in which the treatment consisted of massive radiation, up to 2,905 mg. of radium being used, all except one case have progressively improved up to the present time. Case 1 showed marked improvement of symptoms, but finally died; Case 2, under observation for three years, paralysis entirely relieved, no evidence of disease except by roentgenogram; Case 3, lymphosarcoma has been gone for four years after treatment was started; Case 4, vocal cord paralysis cleared up and evidences of mediastinal tumor absent for more than a year; Case 5, treatment insufficient yet patient free from all subjective disturbances and growth markedly reduced in 18 months; Case 6, one year after treatment begun, roentgenogram in case of mixed cell sarcoma shows but little sign of tumor and the patient has symptomatically recovered; Case 7, desperately ill patient with a granuloma, probably Hodgkin's disease, is apparently in perfect health one year after treatment was started; Case 8, thirty months after beginning of treatment patient, who had a mediastinal tumor with hydrothorax, is now apparently fully recovered.

In addition to these eight cases, two patients with tumor of unknown type improved greatly, but have withdrawn from treatment; one patient with sarcoma improved greatly until burn precluded further treatment and the tumor has since grown much more; one small growth of unknown character, uninfluenced by treatment, has remained stationary for more than a year; one spindle cell sarcoma of the heart was not benefited.

The results obtained in these cases open up a new field of therapy and would seem to offer not only alleviation but cure of these sufferers who have been regarded for the most part merely as pathological curiosities and not as subjects for medical or surgical treatment.

(Continued on page 255)

# EYE, EAR, NOSE AND THROAT

## THE ROLE OF ABNORMAL TEETH IN THE PRODUCTION OF SYMPTOMS REFERABLE TO THE EARS, NOSE AND THROAT*

By W. G. Harrison, M.D.,
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The role of diseased teeth in the causation of antrum trouble has long been generally recognized, but there are other pathologic possibilities in abnormal teeth which have not received the recognition by the general profession that their importance would seem to merit.

Brandt[1] has called attention to diseased pulps in the production of suppurative inflammation in the nasal cavities.

Kallibay[2] has stressed the part of aberrant teeth and dentigenous cysts in the production of neuralgia in and about the nasal area.

Weeks[3] has recently revived the question of causal relationship between nasal obstruction and dental malocclusion.

Pollock[4] has reviewed the literature of suppurative perichondritis of the nasal septum resulting from alveolar periostitic abscess of the incisors, finding eight cases together with one of his own. He likewise found in the literature 106 cases of arthritis resulting from diseased incisors.

Baldwin[5] has called attention to the role played by erupting teeth in the production of tonsillitis and earache.

Allport[6] mentions myringitis, deafness, furuncles and eczema as frequently resulting from dental disorders and he urges the careful examination of the teeth in all cases of aural discomfort.

Bennett[7] reports a case of obstinate deafness of a middle-aged woman from unknown cause relieved by extraction of roots of the second and third molar teeth.

Scarisbrick[8] directs attention to the frequent association of enlarged tonsils with carious teeth in school children. He reports examination of some 4,000 children and concludes that enlarged tonsils are found with greater frequency in those having dental caries than those with perfect teeth. The incidence of enlarged tonsils is greater among children having many bad teeth than in cases with only two or three carious teeth. Marked enlargement of the tonsils is much more frequent even than moderate tonsillar enlargement among children with caries as opposed to children having perfect teeth.

Peglar,[9] Richards,[10] Grason,[11] Cryer,[12] Douglas,[13] Farlow,[14] Huschart,[15] McKenzie,[16] Patton,[17] Ollagnier,[18] Pont,[19] Ritter,[20] and Makuen[21] have likewise called attention to the general relationship between dental disease and conditions in the ear, nose and throat. One of the most recent and interesting contributions was from Dr. Thomas J. Harris[22] in the *New York Medical Journal* of the current year — a report of 6 cases of dysphagia and dysphonia of dental origin, all of which are said to have been permanently relieved by proper treatment of the teeth. In May, 1912, the writer heard Dr. W. H. Haskin, of New York, read a paper before the American Rhinological, Otological and Laryngological Society, at Washington, in which he called attention to the role of latent apical abscesses in the production of pain in and about the face. The unrecognized possibilities for evil of painless concealed abscesses seemed so great that he returned home and immediately sought an association with a dentist carefully trained in radiographic work; and since that time has made studies of the teeth in all private eye, ear and nose cases presenting obscure symptoms, or symptoms not readily explained by pathologic findings in these areas. The following cases embrace brief extracts from the histories of only a few that have been recognized and relieved through the aid of a consulting dentist, Dr. C. W. Lokey, of Birmingham, Ala. About sixty-five individual cases have been studied—some thirty or more gave chief symptoms referable to the eyes, about thirty-two complained of symptoms in the nose, face, ear and throat. Only eight of

*Presented as Thesis for Membership in the American Laryngological, Rhinological and Otological Society, November, 1917.

these are reported at length. Several others, especially one of edema of the larynx, were of unique interest, but owing to the difficulty of establishing a definite causal relationship some of the most interesting cases are not given.

The cases detailed below have been selected for this report because most of them were under observation for some months (either by the writer or other physicians) before attention was called to the teeth as a possible factor in their etiology. Most of the cases have been carefully watched for a year or more to note a possible return of former symptoms.

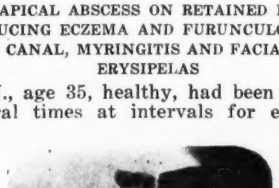
## CASE REPORTS

### CASE I—APICAL ABSCESS SIMULATING ACUTE MASTOIDITIS

Mrs. W. was complaining of a severe pain of three weeks' duration radiating from the right mastoid. She was referred by her family physician for a mastoidectomy and was eager for the operation. Examination of the ear was negative; the hearing normal. There was some redness and great tenderness over the mastoid, especially over the antrum. There was marked contraction of the right sterno-cleido-mastoid muscle and tenderness along its anterior border. Beyond this there was nothing of interest in the examination. The nose and throat seemed negative. The second upper right molar was carious and the gums were red, swollen and tender. She was referred to a dentist, who extracted the tooth with an attached apical abscess. He curetted the cavity and packed it with iodoform gauze. Forty-eight hours later all symptoms about the mastoid had entirely disappeared. After four years she has suffered no recurrence.

### CASE II—APICAL ABSCESS ON RETAINED MOLAR ROOT PRODUCING ECZEMA AND FURUNCULOSIS OF CANAL, MYRINGITIS AND FACIAL ERYSIPELAS

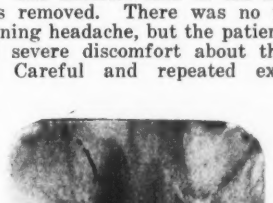
Mrs. N., age 35, healthy, had been treated by me several times at intervals for eczema and furunculosis of left external auditory canal. She had frequent attacks of inveterate eczema of the canal on the left side, never any discomfort in the right ear. On two different occasions she had attacks of left myringitis. In the spring of 1912 she had an attack of facial erysipelas beginning at the lobule of the left ear. During the time her temperature reached 105°. It was just after this attack that the writer heard Dr. Haskin's paper and immediately upon returning home had radiographs made and found a root of the left third molar remaining in the jaw. Her dentist had removed the tooth four years previously, assuring her that the broken root would "become encysted and never cause trouble." The radiograph showed an apical abscess or granuloma at the end of this root. Under gas enesthesia her dentist removed the root, curetted the abscess cavity and after five years there has been no return of the discomfort in or about the ear.



Case 2—Radiograph represents condition of retained tooth root in Case 2. The picture, however, is not from Case 2, the original radiograph being lost. In this picture one notices abscess at the roots of the remaining molar teeth.

### CASE III—SEVERE FACE-ACHE AT ROOT OF NOSE BETWEEN EYES, OF LONG STANDING DUE TO APICAL ABSCESS OR GRANULOMA OF FIRST LOWER MOLAR

Mrs. L., age 35, healthy, had headaches for several years. Sometimes they seemed worse from mere use of the eyes. Sometimes they are worse on waking and disappear after 9 to 10 o'clock in the morning. The eyes were refracted and the headache made better, but not completely relieved. The sinuses were negative as to any inflammatory condition, but there was definite contact between the septum and the left middle turbinate. The anterior half of the middle turbinate was removed. There was no recurrence of the morning headache, but the patient felt frequent and severe discomfort about the root of the nose. Careful and repeated examination failed to elicit any cause for this remaining pain. She was the wife of a prominent dentist, himself an expert radiographer and he made careful studies of her teeth and found no possible cause for the reflex pain and as is so often the case the patient was regarded as hysterical. One peculiarity of this pain was that it recurred with increased intensity for two or three days preceding each menstrual period. After several months of careful and unavailing study it was decided to have radiographs made by two other men, one a



Case 3—X-ray showing conditions in Case 3. No definite abscess visible on either tooth root. When extracted each root was found to have large abscess attached to first molar.

dentist and the other a general roentgenologist. These pictures were likewise negative, that is, they were not definitely positive, and there was some difference in opinion between the consultants as to what was present at one of the roots. About this time the husband of this lady was confined to his bed at home for several weeks recuperating from appendicitis and had occasion to witness the great suffering of his wife. The pain was limited largely to the root of the nose and between the eyes, occurring at any time and worse after worry or fatigue. After several consultations it was decided to remove the only tooth having a dead nerve and, to our great surprise, when it was extracted each of the three roots brought away a definite apical abscess granuloma. This has been a rather disconcerting experience. As will be seen from the radiograph, there was no definite indication of an apical abscess; there seems to be some abnormality of tissues between the molar roots; but nothing comparable to the usual abscess. Until this time we felt that a negative radiograph was definite proof that there was no abscess present, but we have since learned from other cases that findings of the x-ray (like every other test in medicine) are of conclusive value by their presence and never by their absence. Within a week this pain entirely disappeared together with some rheumatic discomfort in one hand which had been present on several occasions. After a lapse of two years there has been no recurrence of pain.

CASE IV—PAIN IN LEFT ANTRUM AND LEFT PAROTID REGION OF TWO YEARS' STANDING DUE TO IMPACTED THIRD MOLAR

Miss V. S., age 20, in good health and free from all evidence of disease in or about the nose or ears, had had frequently recurring pain radiating from the inner canthus of the left eye through malar bone toward the external auditory canal for two years. The pain was sometimes so severe

Case 4—Impacted lower third molar.

as to interfere with sleep. Careful examination by internists was negative. A Wassermann was negative. Refraction of eyes gave no aid—patient accepting + .50 D. S. for each eye. The teeth were in perfect condition; the third molars unerupted. Radiograph showed impaction of the left third lower molar. Removal of this impacted tooth relieved all pain and after a year's time there has been no return.

CASE V—TINNITUS, STUFFINESS AND FULLNESS OF EACH EAR WITH PAIN IN EXTERNAL AUDITORY CANAL OF THREE YEARS' STANDING RELIEVED BY REMOVAL OF TWO LOWER IMPACTED THIRD MOLARS

Mrs. P., age 25, in excellent general health, had had ringing in the ear, a sensation of "stopped up" ears, together with fullness off and on for five years. She suffered much pain in malar region on each side and in the brow above each eye. She had noticed that she was particularly worse around menstrual periods. Her tonsils

Case 5—Impaction of lower third molar.

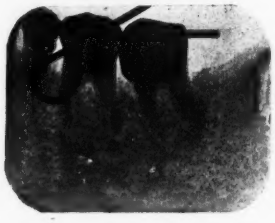
had been removed and the inferior tubrinates had been cauterized and the Eustachian tubes had been inflated five or six times each spring, but these measures failed to bring any definite relief. She said she would have been worse probably without the treatment. On examination of ears they appeared normal and the whispered voice test gave 12/20 for the left ear and 10/20 for the right. Rinne was positive in each ear. Weber negative. There was no change in the test after use of the Eustachian catheter. Radiograph showed impaction of both lower third molar teeth.

Dr. Lokey removed the left wisdom tooth and the patient was so nervous and frightened that she declined to have the right tooth extracted at the first sitting. A week later she returned, saying that she had had complete relief of all symptoms in the left ear and left side of face. There was now no noise and no sensation of fullness on that side, but that the symptoms of the right side were quite unrelieved. For some reason it was impossible to remove the right tooth for a full month after extraction of the left and during that period her discomfort was limited to the right side, disappearing within four days after the extraction of the right wisdom tooth. Six weeks later her hearing was normal. She has been well two years.

CASE VI—PAIN IN RIGHT ANTRUM EXTENDING INTO AND AROUND THE RIGHT EYE BALL RELIEVED BY THE EXTRACTION OF THE FIRST AND SECOND LOWER MOLARS, EACH WITH APICAL ABSCESS

Mrs. L., age 40, good general health, had been refracted twice for headache aggravated by all near work. Lenses had given definite relief, but in spite of glasses has suffered frequent pain in right eye and right antrum greatly increased when she was weary; and during the three days preced-

ing each menstrual period so severe as to interfere with sleep. There was contact between the septum and middle turbinate on the right side, and radiograph showed slight cloudiness of the right antrum. She gave a history of having had acute inflammation in this right antrum which was relieved by washing through a canular introduced beneath the lower turbinate. The antrum was



Case 6—Ill-fitting crown. Definite abscess at two roots of the anterior molar and the anterior root of the second lower molar.

washed out with negative result. The anterior half of the middle turbinate was removed. Patient felt sure that this operation afforded relief for several months, but the pain never entirely disappeared. A radiograph of the teeth by a dentist showed apical abscess at the root of the second upper bicuspid. It was extracted with some amelioration of all symptoms. After three or four months she returned complaining of a gradual increase in severity of pain, and I then had her denist for a second consultation. I now learned for the first time that she had declined to have other teeth extracted at the former consultation, although the dentist at that time had discovered latent abscesses at the roots of the first and second molars in the upper jaw. The bicuspid was easily recognized as having the largest abscess and the patient reluctantly consented for its removal but declined to have the molars drawn. The patient was now urged to have these teeth drawn, but again declined and suffered more or less of her usual symptoms for another three months before consenting to extraction. Within a week after the removal of the teeth all symptoms disappeared and have not recurred after one year.

CASE VII—GENERAL FACEACHE, HEADACHE, VERTIGO AND NAUSEA, DISAPPEARING AFTER EXTRACTION OF DECIDUOUS TOOTH, RELIEVING PRESSURE FROM UNERUPTED CANINE

Mrs. T., age 34, had had headache almost daily for six years. She wore glasses for compound hyperopic astigmatism and careful refraction under a midriatic suggested little change in lenses. There was a left hyperphoria, two degrees, for which a prism was incorporated in the new lenses. The patient felt some relief from the headache and a great improvement in the dizziness from these glasses, but she returned in three or four months insisting that the headaches were unbearable. Careful examination failed to reveal any trouble with the sinuses. A radiograph of the sinuses was negative. There was marked deflection of the nasal septum, producing contact with the middle turbinate of the right side and the lower turbinate of the left. Under ether anesthesia I did a submucous resection of the septum and secured satisfactory and comfortable breathing. (A unique complication followed this operation—an alarming hemorrhage on the fifth day and recurring at successive seven-day periods for four weeks, necessitating careful packing of both nares each time.) After recovering from this operation the patient was relieved for almost a year of all vertigo with its attending nausea and had few headaches except at the menstrual periods. One year later, after strenuous overwork attending some social service activities, there was a recurrence of a peculiar agonizing faceache and headache, and not until this time did it occur to me to employ the assistance of dental radiograph. The negative showed an unerupted canine and I advised its immediate removal. Her dentist, however, declined to remove

Case 7—Unerupted canine tooth pressing on deciduous tooth below.

the tooth, but extracted the baby tooth below it, assuring her that the tooth would grow in its proper position, replacing the one he extracted. Much to my surprise, there was almost instantaneous relief from pain, and it has not recurred after an interval of sixteen months. There is no indication that the unerupted canine will come down into its proper place. She suffered great inconvenience from vertigo about six weeks later, and it was then found she had a perfect balance of the external eye muscles. The prisms were taken from her glasses, giving immediate relief from her vertigo. She has been free of all discomfort for a year.

CASE VIII—PAIN AND TENDERNESS IN LEFT ETHMOID, LEFT EYE AND FRONTAL SINUS OF EIGHT MONTHS' DURATION PROMPTLY RELIEVED BY DRAINAGE OF APICAL ABSCESS AT ROOT OF UPPER LATERAL INCISOR

Mrs. W., age 44, good health, and a rather negative history, complained of severe pain in the left ethmoid, left eye and left frontal sinus. She felt sure that a change of lenses would correct her discomfort. These were given and she seemed better for two months—certainly the "pain is not aggravated by near work as formerly—but it has been so bad between 10 P. M. and 5 A. M. for the past three nights it has been necessary to take an opiate." A radiograph of the frontals, ethmoids, antra and sphenoid was negative. Trans-

illumination was likewise negative. On examination of the nose there was an ovoid mass projecting from the left side of the nasal septum into the left lower meatus. It was soft, painless, easily indented with a probe. There was no redness nor other sign of inflammation. Patient had felt that the nose had been obstructed. It had the appearance of a hematoma. Under cocaine anesthesia this sack was punctured with a hypodermic needle and an ordinary syringeful of pus was removed. The cavity was then freely cleansed and drained. It was impossible to discover the source of infection. There was complete relief from the pain for several days when it recurred with its former intensity. A radiograph showed that the root of the left upper lateral incisor had not been filled to its end and there was probably some thickening of the peridental membrane, but no definite dissolution of the bone. Dr. Lokey amputated this root, draining the abscess cavity and packing it with gauze. This afforded instant and permanent relief.

Case 8, Radiograph 1—Abscess on end of upper lateral incisor.

Case 8, Radiograph 2—Shows the tooth has been amputated and the canal refilled from its upper end.

It is to be regretted that there was no thorough pathological study of the tissues and bacteria of these cases, and yet it would seem that from clinical experience alone one would be justified in drawing some conclusions.

1. Dental abscesses and granulomata rarely produce local symptoms in or about the gums.

2. Latent abscesses and impacted teeth may produce pain suggesting eye strain, chronic and acute otitis media.

3. Headache, vertigo, face pain, stuffiness and fullness within the nose or ears may be produced by unerupted teeth.

4. There may be definite latent dental abscesses producing discomfort and these may escape detection even by most careful radiographic examinations.

5. Radiographic studies of the teeth are essential in any scientific effort to locate the cause of the pain in or about the face or head.

6. It is wisest to have these radiographs made and interpreted by a dentist who has made a thorough study of these conditions.

7. Isn't it about time to say that all teeth with dead nerves should be extracted since it is well-nigh impossible to be sure the roots are properly disinfected and filled and if not so treated they become a menace to all future health?

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## THE TREATMENT OF PNEUMOCOCCUS ULCER OF THE CORNEA WITH THE THERMOPHORE (METHOD OF DR. W. E. SHAHAN)*

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The value of moderate heat as a therapeutic measure in various ocular diseases has long been recognized. Applied in the form of a compress (dry or wet) it is useful in bringing a stye to a head, in alleviating the pain of a keratitis, iritis or glaucoma. Warm saline or boric acid douches are often grateful in conjunctivitis, or after the removal of a foreign body from the conjunctiva or cornea. Heat thus applied induces hyperemia and tends to relieve lymphatic stasis.

Higher degrees of heat have been used to combat ocular infections in the hope of destroying the organisms concerned in the process. If the lesion is accessible, e. g., an ulcer of the cornea, the superficial organisms can be incinerated quickly by the use of the actual cautery. Inevitably, sublying and adjacent tissue is also destroyed, so that, even if the ulcerative process is brought to a standstill, the resultant scar is dense and often much larger than the area ulcerated. Radiant heat (by means of a heated metal ball held close to the eye) and hot air and steam (forcibly projected against the diseased area) are methods of undoubted value, but have the great disadvantage that neither the intensity nor quantity of heat can be controlled or measured.

In 1916, Shahan[1] presented the results of animal experimentation to determine the physiologic limit of heat tolerance, which he defined as the "maximum temperature at which tissues may be held for stated lengths of time without permanently harmful effects." It was his aim to determine whether the organisms responsible for certain infective processes could be killed by a degree of heat not exceeding the physiologic limit of heat tolerance for the tissue infected. The study was prompted by a realization that many pneumococcus or serpiginous ulcers of the cornea went on to destruction of the eye despite the unremitting application of accepted therapeutic measures.

A means of applying constant, measured quantities of heat directly to the corneal surface was not at hand, so Shahan was compelled to devise an instrument for this purpose. This so-called thermophore "consists of a metal tube containing a thermometer, and surrounded by a resistance coil to generate heat, while within the latter is placed a zinc-iron sensitive strip to permit the temperature to be kept at any constant point. Into one end of the metal tube are inserted applicators of various shapes, to be applied directly to the cornea."[2] He soon found that different tissues of the eye have different limits of heat tolerance. Thus the corneal epithelium was found to withstand an application of 116° F. for ten minutes, whereas 117° F. for ten minutes produced after twenty-four hours a desquamation of the epithelium. Experiments showed that the substantia propria had "no sharply defined limits of physiologic tolerance to heat," but 130° F. was thought to be as high as it was safe to go. A transient miosis was produced by 116° F. for ten minutes. The temperature in the anterior chamber was elevated 15 to 22° F. by the application of different degrees of heat. The vitreous was apparently unaffected.

Experimental pneumococcus ulcer in rabbits was subjected to 130° F. for ten

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[1]Shahan: Jour. A. M. A., August 5, 1916.
[2]Shahan and Lamb: Amer. Jour. of Ophthalmology, August, 1916.

minutes with negative results, i. e., the infective process was usually not controlled and positive cultures could be obtained from the site of the application. A later series of experiments, in which higher degrees of heat were applied for one minute only, gave entirely different and much more satisfactory results. It was found that 152° F. for one minute was sufficient to stop the ulcerative process both bacteriologically and clinically. Application of this degree of heat to the normal eye of a rabbit produced destruction of the epithelium over a slightly larger area than the size of the applicator, but no other permanent pathologic change. Results in a series of human pneumococcus infections of the cornea were also very encouraging. Application of the thermophore for one minute at 154 to 155° F. resulted usually in prompt checking of the extension of the ulcer, diminution or disappearance of hypopyon and lessening or abolition of pain.

A simplified thermophore, suitable for one-minute applications, has recently been devised. This consists of a nickle-plated brass applicator (several applicators of different sizes and shapes are provided) hollowed out to receive the bulb of a thermometer. The applicator is snugly fitted into the end of a hollow core (made of brass), at the upper end of which is a lock nut for holding securely the thermometer. After heating to the desired temperature (over a spirit lamp or Bunsen burner), the core is inserted into a case, lined with felt, which serves as an insulating jacket for retaining the heat.

I presume that no one enters upon the care of a pneumococcus ulcer of the cornea without misgivings as to the outcome. I have used a variety of agents: tr. iodin, pure phenol, trichloracetic acid, the actual cautery, methylene blue in solution and powder, optochin, etc. If, in spite of treatment, the ulcer extended and hypopyon formed, I did not hesitate to perform a Saemisch section with evacuation of the hypopyon. While this procedure was generally the means of retaining the globe, it often happened that the resulting dense and extensive scar reduced vision to little more than light perception. One hesitates to operate upon an eye of this character except as a last resort. And last resort measures, in any line of surgery, are usually not productive of brilliant results.

During the past summer I had the opportunity of trying Shahan's method on five cases of pneumococcus ulcer of the cornea.

CASE REPORTS

Case I.—J. R., a coal miner, was seen in consultation July 2, 1917. About two weeks before he had been struck upon the left eye by a small piece of coal. Several days later, the eye having become very painful, he consulted his physician, who noted a central corneal ulcer and treated the eye with argyrol, atropin and hot compresses. An ulcer measuring 4 x 5 mm. occupied the centre of the cornea. There was hypopyon rising to the level of the lower margin of the semidilated pupil. Smear and culture showed pneumococci. The simplified thermophore with tip corresponding to the size of the ulcer was applied at 158° F. to the ulcer for one minute. (The temperature ran down to 145° F. during the application.) The patient submitted to the heat treatment without showing any signs of pain. He was advised to remain in the city for observation, but declined to do so. His physician was instructed to use argyrol, atropin and a boric wash. Nine days later he reappeared much improved; the hypopyon had disappeared. The ulcer had not spread, but the base was a dirty yellow with fine lines of infiltration extending outward into the deep layers. Thermophore (small tip) applied at 158° F. for one minute. Patient again insisted upon going home. Ten days later he reappeared with the statement that he had had severe pain the day before, but that the eye had felt better since then. There was a small central perforation. He remained in the hospital six days, when, against advice, he returned home. There was considerable necrotic debris adhering to the base of the ulcer, but there was no sign of a fresh purulent infiltration. This case was the least satisfactory of the series, as we failed to gain the co-operation of the patient, and I rather expected a poor result. Judge of my surprise when I learned from his physician that he had made a good recovery. Quoting from a letter received September 22, 1917: "He has a rather dense scar, but I think the result is very satisfactory. In cloudy weather when pupil is dilated somewhat, he can see a little."

Case II.—H. J. B., male, age 57, brought to hospital July 1, 1917, and seen by me late that evening. Four days before, right eye had been struck by a sheaf of wheat. He was seen by his physician twenty-four hours later. Two corneal ulcers, temporally from pupil, were noted. Silvol 10 % and atropin were used. As the ulcers were increasing in size and grey lines of infiltration were extending from one to the other, his physician brought him to me. The case was very critical as the fellow eye had been lost from ulcer years before (there was a dense flat scar of the cornea of the left eye.) To complicate matters

further, he had a chronic bilateral inflammation of the lacrimal sacks, from which thick creamy pus could be expressed. The right cornea was the seat of three small round ulcers about 2 mm. temporalward from the centre. The lower two were confluent. A slough was picked out with a platinum loop and a smear at once examined for pneumococci which were not found. No opportunity was afforded that night for making a culture. The following day, in consultation with Dr. Shahan, it was decided to await bacteriological confirmation before applying the thermophore. In order to obviate the probability of continuous reinfection, I immediately cut down on the lacrimal sack and cauterized it with trichloracetic acid. The following day the upper ulcer measured 3 x 3.5 mm. and the lower 4 x 3 mm. The culture showing pneumococci, the thermophore was applied for one minute to the upper ulcer and for one minute to each of two areas of the lower ulcer. Argyrol 30 %, atropin and cocain in castor oil and boric acid 2 % as a cleansing wash were ordered. Internally iron, quinin and strychnia.

July 4: Had a comfortable night. Patient declares "the fever has gone out of my eye." A vertically oval area 6 x 4 mm. stains with argyrol.

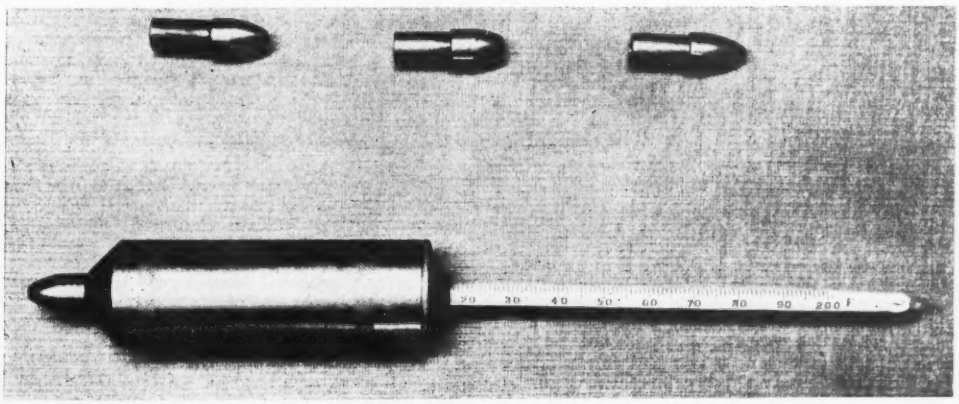
July 10: Ulcerative process evidently checked except at lower margin, where there is a yellow infiltrate in shape of a horseshoe. Thermophore applied for one minute to this area. From this time there was no interruption in the reparative process. He left for home August 6.

September 10: Scar is remarkably thin. Eye free from irritation. Pupil dilated from atropin. With—2 sph. V 6/20. With + 3.5 reads Wells No. 3. Trichloracetic acid cauterization of left sack (as a prophylactic measure to prevent possible future infection of right eye).

Case III.—C. L., aged 68, farmer, was referred to me July 30 by his family physician. He had scratched his left eye with a straw several days previously. His physician had used atropin, boric acid and argyrol. There was a superficial ulcer of the left cornea without hypopyon. As I was leaving on my vacation, the patient came under the care of my associate, Dr. William F. Hardy, who found pneumococci in smears. Two days later the ulcer showed a yellowish border up and temporally, with a small hypopyon. Thermophore applied one minute at 158° F. The day following the notes read "little pain, considerable leukocytosis and desquamation, hypopyon less." Patient was treated daily with silver nitrate 1/5 %, atropin and cocain in oil and saline irrigations. The ulceration was wholly checked and he made an excellent recovery V 6/40. A stenosis of the duct on the corresponding side yielded to the passage of large probes (Theobald 9 and 10).

Case IV.—C. M., age 38, coal miner, seen August 19, 1917. Several days ago was struck in the left eye by a small piece of coal. Central ulcer of cornea, measuring 4 x 5.5 mm. with hypopyon. Smear shows pneumococci. The ulcer was treated in the usual manner with the thermophore. Atropin and dionin solution, 1 %, was ordered four times a day. Argyrol 10 % and atropin were used in the office. The single application of the thermophore absolutely stopped the process. In ten days the hypopyon had disappeared. Patient allowed to return home September 8. Last seen September 29. Scar not dense, but because of its central location vision is cut down to 6/40.

Case V.—D. L. W., age 60, was referred by his physician September 10, 1917. Toward the end of an attack of variola in June the right eye became sore. He was treated by an oculist for what, from his description, appears to have been a severe conjunctivitis. The eye did not get well and about August 1 an "ulcer came on the eye." He abandoned the oculist in favor of a traveling quack, who presented him with three mysterious vials—the first to be used in the morning, the second at noon, and the third at night. But, sad to relate, the ulcer spread and the pain became unbearable. The right cornea showed a large central ulcer measuring 3 x 3.5 mm. with hypopyon rising to one-third the height of the cham-




Shahan's Thermophore showing applicators of different sizes and shapes.

ber. V. fingers at 1 m. Culture showed pneumococci. Thermophore applied at 158° F. for one minute (dropped to 152° F.). Atropin, silvol, ordered. Following the heat treatment, the patient had a comfortable night. For several days the ulcer remained stationary. Finally, on September 15, it perforated and all the hypopyon was evacuated. After this progress was much more rapid. October 6 the ulcer had healed and V. 6/40. There was no anterior synechia and only one posterior adhesion. November 6: V. improved to 6/32. Scar inconspicuous.

It is unwise to speak too dogmatically of the value of a new therapeutic method on the basis of so limited an experience as mine, yet I cannot escape the conviction that Dr. Shahan has presented us with a method of permanent value in the treatment of these infections. The size of the applicator, the degree of heat, and the duration of the application are all measurable quantities; hence the method has an exactitude far exceeding that of other therapeutic methods. There is no evidence that the ocular tissues are damaged by 158° F. for one minute; the only immediate destructive effect is on the epithelium which is soon replaced. That the infection is checked is proved by the limitation of the spread of the ulcer, the disappearance of hypopyon and the control of pain. Even in cases where the infection is well advanced and perforation is inevitable, the thermophore will promptly put a stop to tissue necrosis, the perforation will be small and will tend to close so promptly that anterior synechiae will not have time to form.

In conclusion, I desire to express my deep obligation to Dr. Shahan for his hearty co-operation and assistance in the treatment of the cases reported above.

626 *Metropolitan Bldg.*

## DISCUSSION

*Dr. W. E. Shahan, St. Louis, Mo.*—I have been intensely interested in Dr. Green's report of these cases, especially as they constitute the first independent observations on this mode of corneal thermo-therapy. This mode of thermo-therapy was not the result of a happy thought or fortunate accident, but was elaborated by a series of animal and laboratory experiments extending over a period of several years. It differs from all other modes in its exactness. The precise dose of heat necessary to kill pneumococci within the substantia propria has been worked out and an easy and uniform way of conducting this dose into the corneal tissues has been provided.

In the earlier series of animal experiments relatively low degrees of heat were applied to virulent pneumococcus ulcers for relatively long periods of time. For therapeutic purposes this method proved to be a failure. But during these experiments it was found by means of junctions of thermo-couples placed within the anterior chamber against the posterior surface of the cornea, that when a given temperature was applied to the anterior surface of the cornea, the temperature of the posterior surface rose rapidly and reached a maximum in about one minute. Accordingly, in the later experiments, which proved successful, increasingly higher temperatures were applied to virulent pneumococcus ulcers for one minute only until a point was reached where the organisms were killed within the substantia propria. This proved to be 152° F. (66 2/3 C.) with the constant temperature thermophore shown at the Detroit session of the American Medical Association, and 158° F. (70 C.) with the simplified instrument shown at the New York session of the American Medical Association in 1917.

When the cornea is thoroughly anesthetized with cocaine 5 % in suprarenal extract 1/4000 the required amount of heat (or initial temperature of 158° F.) can be applied directly and exclusively to the infected area for one minute, easily and without a particle of pain. If the patient has not been frightened by being told that the applicator won't "burn" him, etc., and holds still so that the application has been continuously made, a subsequent application ordinarily will not be needed. Although the application is in itself painless, there will likely be some pain for several hours afterwards. This can be controlled by occasional instillation of cocaine-atropine solution. After this period has passed the first and most striking result of the treatment is freedom from pain. The patient will spend his first comfortable night after a succession of sleepless ones. Unless there is an exacerbation there will be no marked return of pain. If there is an exacerbation it will likely occur from two to six days after the application, and another application will have to be made, and in very stubborn cases with deep infiltration perhaps a third or fourth application.

Treatment subsequent to the application is very simple, consisting of the daily use of some mild cleansing agent as argyrol 25 %, normal salt solution, etc., and the use of atropine as indicated by the iritis, which is always present if the stage of the hypopyon has been reached.

The mode of action of the heat applied is threefold:

First, direct destruction of the organisms within the substantia propria.

Second, expulsion of toxins, dead bacteria, etc., by a lymph flow established shortly after the application.

Third, a general luecocytosis of the cornea which reaches its height two or three days after the application.

In pneumococcus ulcers of the cornea (hypopyon keratitis) the results in nearly forty cases in human eyes have been so uniformly positive that the method may fairly be termed specific for those conditions. In ring ulcers of the Mooran type it offers no definite encouragement.

*Dr. R. H. T. Mann, Texarkana, Tex.*—There was just one danger in the old method of using the electric cautery on ulcers of the eye, and that was overheating the aqueous humor and causing cataract. I am glad to hear them say that with a temperature of 159° no permanent damage can be done to the eye from the excessive amount of heat.

*Dr. Green (closing)*:—It is possible that corneal ulcers other than those due to pneumococci may be benefited by this treatment. Dr. Shahan's investigations, however, have been concerned only with ulcers of that type. It occurs to me that possibly a gonococcus ulcer in the newborn or in the adult may be benefited by this method.

Dr. Mann suggests the possibility of the development of cataract from overheating of the aqueous. That is an interesting suggestion, but there has been nothing in the experimental or clinical application of the method to make one fear this result.

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## *AUTHORS' ABSTRACTS*

### *Eye, Ear, Nose and Throat*

*The Importance of Early Treatment of Chronic Hypertrophic Otitis Media: Report of a Case* L. Herbert Lanier, Texarkana, Tex. The Charlotte Medical Journal, Vol. 76, No. 6, December, 1917, p. 250.

In chronic hypertrophic otitis media, a chronic exudative inflammation of the Eustachian tube and typanum causes the lining membrane of both to be greatly thickened and the calibre of the tube to be reduced, with resulting impairment of hearing.

The development of the disease is slow and insidious and until some marked symptom such as tinnitus or an appreciable deafness appears, patients may be unaware of its existence. Tinnitus may become constant and evoke great discomfort and nervous depression; deafness may be either unilateral or bilateral during the early stages. But eventually both ears succumb to the catarrhal process.

When the disease has long continued and infiltration with thickening of the membranous lining and consequent diminishing of the calibre of the tube occurs, much may be accomplished by simple inflation, the use of the catheter, or the introduction through the catheter of vaporized medication or superheated air, catheterization and the introduction of medicated vapors, remains the two most effective methods of procedure. The employment of camphor, menthol and iodin equal parts by means of the Dench vaporizer is very effective.

I use the whalebone bougie as much as possible, but find Yankauer's probes best in some cases. I have in recent months found that a probe made of catgut, made by Dr. Kochler, of Minneapolis, is very serviceable and well adapted to many obstinate cases.

## *AUTHORS' ABSTRACTS*

### *Surgery*

(Continued from page 245)

*Bleeding in Pregnancy.* Raymond S. Titus, Boston, Mass. The Boston Medical and Surgical Journal, Vol. CLXXVII, No. 12, September 20, 1917, p. 413.

Titus states that flowing is the most important single symptom in pregnancy. He asserts that any bleeding case is inherently serious and that the sign of blood calls for exact diagnosis and immediate treatment. He vehemently criticises the physician who does not immediately respond to the patient who says she has bled. Putting off such a visit until tomorrow he declares is criminal.

He then proceeds to enumerate the conditions with which bleeding is associated and groups them in three classes:

Group I, those occurring the first three months of pregnancy:

1. Miscarriage.
   (a) threatened.
   (b) incomplete.
   (c) complete.
   (d) septic.
2. Extrauterine pregnancy.
3. Cancer of the cervix.
4. Hydatidiform mole.
5. Cervical polyp.

Group II, those occurring the second three months of pregnancy:

1. Miscarriage.
2. Eroded cervix.

Group III, those occurring in the last three months of pregnancy:

1. Premature labor.
2. Placenta prævia.
3. Placenta ablatio and detached placenta of minor degrees.
4. Ruptured varicose veins.

Under each heading he goes into the diagnosis and treatment, again emphasizing the great need of seeing and examining the patient and not attempting to carry such a case on the telephone. He decries the operation of accouchment force for any condition on the primipara, actively bleeding, who is not in labor, and says it is an operation which ought to be put into discard so far as primiparas go and used only by experienced operators in the occasional case on the multipara. As a general rule, for complete placenta prævias, actively bleeding, not in labor, he thinks the abdominal section will give by far the best results. The same is true for the detached placenta not in labor. For the partial prævia, he advises the Voorhees bag or Braxton Hicks method of delivery. Conservatism, as far as radical operations go, is the undercurrent of treatment. He thinks that one might just as well lose a patient from the condition for which you are treating her as from an ill-chosen operation which kills because of its subsequent shock.

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*On active duty, Medical Reserve Corps, U. S. Army. Granted leave of absence for period of war.


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## EDITORIAL DEPARTMENT

### COMMUTATION FOR ARMY OFFICERS

No one doubts that we have the kindliest Government under the sun. So that our comment about the matter which we wish to consider is not a criticism of motives, but a desire to call attention to an oversight in legislation which works a hardship upon the families of Army officers who see service abroad or who may be stationed in camps and cantonments at home.

Under the present law the Government provides suitable quarters for officers' families at regular Army posts; but when they are stationed in Washington or in other cities, where no quarters are available, a monthly allowance, or "commutation," for house rent, water, fuel and lights, is provided. This amounts to 17 to 25 % of the monthly salary of an officer. However, there is no provision for commutation to officers who are in camps or cantonments, which really penalizes the officer who is on foreign duty or who is now at one of the training camps.

Since the members of the Medical Reserve Corps are not stationed in regular Army posts, they have to continue to provide for their families at home and at the same time pay their own expenses.

There is a bill in Congress which has been approved by Secretary Baker providing that a commutation be given to all officers, wherever they may be stationed. Since this bill vitally affects the officers of the Medical Reserve Corps, they and their friends should interest themselves in seeing that legislation is enacted which will remedy an apparent oversight.

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### THE CO-OPERATION OF THE PHYSICIAN AND DENTIST

With his *modus operandi* geared in high, the physician has been running for scores of years unmindful of the fact that the highways he traverses are studded with the strange phenomena that are the outgrowth of civilization and that to meet the exigencies of the day, many new parts to the machinery must be incorporated and due consultation must be had with varied and sundry mechanics and engineers. The evolution of medicine and the liberal, intensive education of its disciples has been responsible for the constructive changes that have been inaugurated in the science within the past decade, and, perhaps, to the x-ray must be ascribed full credit for the reconciliation instituted between medicine and dentistry, between doctors and dentists, between the above-mentioned drivers and mechanics.

It would be a matter of guess work to place an estimate upon the lives that have slipped into early oblivion because of the absence of this essential affiliation of kindred sciences, and surely had the chapters on the etiology and prognosis of diseases in the many medical and surgical textbooks earlier called attention to and emphasized the important role of the teeth in the study of disease, the advances would be greater in this particular endeavor. Unfortunately this epoch in medicine was

initiated by a great furor on "focal infection" and because so many clinicians went off at tangents upon the value of their findings, at times straining the most vivid imagination to follow their conclusions, the more skeptical members of the profession would ridicule this theory as a panacea for explaining idiopathies, and ultimately used this as a subterfuge for their ignorance and ability to achieve success in many treatments. However, facts have been brought to a rational basis of interpretation, and when the momentum of the two sciences was co-ordinated, the results were convincing, the developments rapid and the importance of the work was of unquestioned character.

From the foregoing it can be adduced that medicine and dentistry must be correlated but not confused. There is a peculiar sphere for each in this happy amalgamation, which must be zealously guarded by their respective members. For instance, radiographs of the teeth are made by the medical and dental roentgenologist. The next step is that of interpretation, which should be assigned to the man of qualification and experience, which may fall to the medical or dental graduate, but under ideal conditions more logically to the latter. After the interpretation of findings comes the process of elimination so that a diagnosis may be concluded, and it is at this juncture that the science must not be confused. The physician or surgeon must carefully weigh the clinical picture of his case, and when justifiable the opinion of the dental surgeon and pathologist should temper his prejudices and aid in formulating a diagnosis and treatment. In short, radical extremes are to be avoided and over-enthusiasm over fascinating diagnostic agents suppressed.

It has been the function of the research student in medicine and dentistry to blaze the way leading to a more adequate and intimate knowledge of the diseases attributable to oral infections; and to the remainder of the profession it becomes a legacy to keep alive and on a forward march the precepts of such study. There are many physicians who ignore mouth conditions because the patient happens not to complain of toothache and there are others who forget that "gold crowns" (done before x-ray days) cover a multitude of germs and yet may be of no discomfort to the individual. These men are more of a source of danger than the pathological conditions and it is clear wherein lies the brunt of the burden in our endeavor to boost mankind.

After a thorough schooling of the professions the next important task is to inform the public of the need for early and complete dental examination, the importance of prophylaxis, the major role the teeth play in the causation of organic lesions, the necessity of consulting dentists of ability and those prepared to give exhaustive examinations, the practical cooperation of doctor and dentist — indeed there should be a reciprocity in references between the professions—and the regulation of fees so that the patient will not feel that the medical man is paid sufficiently to compensate not only himself but the dentist, and vice versa. In the last analysis the local physicians and dentists should become familiarized with the merits and qualifications of their co-workers so as to insure for the public satisfactory and able services.

These are a few of the arguments that constitute the theme of co-operation of the physician and the dentist, and while volumes could be written upon this important subject, it is hoped that the foregoing may serve as food for thought and cause these co-operative relations to be established in every community. The cities will be provided for, but what of the rural districts and their medical and

dental facilities? Should the lives of their constituents be bartered and sacrificed because of lack of appreciation of this excellent work and the lack of preparedness? The answer is, no.

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## THE PURE FOOD AND DRUG ACT

Few laws on the Federal statute books have had the wholesome, far-reaching and educational effects as the Food and Drugs Act of June 30, 1906. A very graphic review of the first ten years of this Act has been published in the current annual report of the Bureau of Chemistry, United States Department of Agriculture.

In its analysis, the report considers the salient constructive features of the law to be: (1) the health of the public is safeguarded against the frauds in foods, waters and drugs; (2) the enactment of similar laws by the individual states to regulate the intrastate traffic of food and drugs, the interstate traffic being protected by the Federal Act; (3) harmonizing state laws so as to impose no hardships upon manufacturers operating in the various states which has been accomplished through the creation of two agencies, viz: the Joint Committee on Definitions and Standards and the office of Cooperative State and Federal Food and Drug Control; (4) the adjustment of unfair and fraudulent competition between business corporations, in some instances drawing the competitors together into an association; (5) the promotion of scientific research and investigation; (6) development of factory inspection and sanitation; and (7) study of spoilage and decomposition of foodstuffs, and finally the elimination by a merciless prosecution of the clever food and drug adulterator. Yet, in spite of this law—drastic and indiscriminatory—legitimate business has continued, profits have been made and the relation between the public and operator is more cordial and trustworthy than during any preceding decade.

To consider in more detail the valuable and significant advantages derived from this special legislation it will be of interest to note the improved conditions under which shipments of milk, domestic and imported, are carried on; the control of trade of unclean milk; the special attention that has been given to shipments of polluted or spoiled foods; the protection of foodstuffs from contamination of poisons when in the manufacture; the abolition of canning of decomposed navy beans and interstate shipment of oysters from polluted waters; the improvement in the quality of eggs in interstate commerce; the improvement in the handling and the sale of mineral waters, fruit, gelatin, tomato products, and the report from the legal department giving the following amazing facts: 6,000 prosecutions terminated in the courts; manufacturers cited at hearings more than 40,000 times; many thousands of factory inspections made, and over 750,000 shipments of domestic or imported food and drugs examined during the first decade of the Act.

Upon first reflection it seems as though the provisions of the law were executed because of fear of the penalty to be meted out to the violator, but a more logical after thought precludes all motives other than the demands made by the public for health conservation. Perhaps no one body of people appreciate the monumental service rendered mankind by the Bureau of Chemistry as guardians of this enactment as the medical profession, which in turn should continue its loyal support and unhesitatingly expose those artisans of trickery and dishonesty in their endeavor to evade the law. Furthermore, the numerous organizations, whether they be health units or medical associations or

child life conservation clubs or societies composed of laymen for the propagation of health propaganda or the investigation of the food industries throughout the country, should enroll with the Department of Agriculture as ardent exponents of the Food and Drugs Act and aid in making its second decade of usefulness as brilliant, as resplendent with achievements and as conclusive as the one just completed.

## THE LONG-ENDURED "PEST-HOUSE"

Smallpox at this season is prevalent in many parts of the United States, and particularly in the territory of the Southern Medical Association, where the Negro population is large. A certain Southern corporation employing many men finds that 80 % of its colored employees had never been vaccinated when they applied for work. It is, therefore, not surprising that the darkey should bear the brunt of smallpox morbidity.

When Jenner introduced cowpox inoculation as a preventative for smallpox he instituted one of the surest methods which we possess for immunizing against any disease. And that fact is perhaps more generally known by the rank and file of individuals than is any public health measure. People are aware of the very simple and sure means of warding off a terrible and loathsome disease, a malady which not only disfigures but which exacts a not inconsiderable mortality. And yet for the great minority, those who stubbornly prefer to disregard this well-proven scientific truth and submit to a trifling inconvenience for a few days, for this handful of indolent and shiftless, communities are accustomed to maintain so-called "pest-houses" at no small expense. At the same time the streets, public conveyances, restaurants and hotels are frequented by thousands who have tuberculosis, syphilis, etc., and are a constant source of danger to those with whom they come in contact. And for these latter there is no known method of immunity nor is there a legislative enactment segregating those who are in infective stages. It is just one of those inconsistencies which time alone can remedy.

First of all, let us abolish the "pest-house" for smallpox cases and place the valuable saving to other public health uses. The "pest-house" has long since outlived its usefulness. Those recently and successfully vaccinated need have no fear. Let health boards everywhere vaccinate free of charge so that no excuse whatever can be offered on that score.

## THE NEW REGULATIONS FOR LOCAL AND MEDICAL ADVISORY BOARDS FOR EXAMINATION OF DRAFTED MEN*

By the new regulations of the Local Board, after the examination of registrants they are accepted, or rejected, for general military service, or referred to the Medical Advisory Board.

The conclusion by the physicians on the Local Board is based upon a physical examination; their time is not taken up with laboratory tests, nor is it required to make a complete examination except for those registrants accepted for general military service.

The moment a defect is demonstrated a registrant is rejected or referred to the Medical Advisory Board, according to the character or degree of the defect.

By these revised regulations, Local Boards should be able to perform their duties rapidly and accurately. Undoubt-

*The new Regulations of the Local Board (Change No. 3, Office of the Provost Marshal-General, Washington, D. C., January 28, 1918, Part VIII, Sections 182-188).

edly, the Local Boards will accept as physically and mentally fit for general military service, a sufficient number of registrants to supply the demands of the Provost Marshal-General, for new men to be trained in the various cantonments as places are vacated by soldiers sent overseas.

The Medical Advisory Boards, by a proper organization and method, can work more methodically with the group referred to them. These Advisory Boards are in position to apply every test and to take their time to determine the mental and physical condition of the registrants referred to them.

The Medical Advisory Boards may find their work larger than they anticipated, and this work may take more of their time than they expected. However, the medical profession represented on the Medical Advisory Boards throughout the country is given a great opportunity for service. The majority of the membership of the Medical Advisory Boards are not in the Medical Reserve Corps, or if so, are on the inactive list. Even if this work should take three-fourths of their time from their private practice, they should be able to earn more in the time left than the salary of an officer in the Medical Reserve Corps. For this reason their financial sacrifice is not more, and in the majority of cases is less, than the sacrifices their colleagues are making who are in the service and giving their entire time.

This important work of the physical examination of registrants referred by the Local Board to the Medical Advisory Boards must be done according to the Selective Service Regulations. There apparently is no other way to assist the physicians on the Local Boards in their arduous and responsible duties.

With intelligent and faithful labor, the combined efforts of the medical profession represented on these Local and Medical Advisory Boards should be able to select all those physically fit for military service more rapidly than they will be called for by the Provost Marshal-General.

In addition, the Medical Advisory Boards select from those registrants who do not come up to the requirements of unconditional acceptance and who do not fall within the limits of unconditional rejection, a group of registrants with some defect, who will be able to do special and limited military service, according to their occupation and special training in civil life.

All registrants who are suffering with defects which come within the standard of unconditional rejection are unfitted for any military service, and according to the Selective Service Regulations, they are placed either originally by the Local Boards or after the examination by the Medical Advisory Boards, and referred to the Local Boards in the so-called Division G, Class 5. This classification prevents their being called into military service of any kind.

# BOOK REVIEWS

**White and Martin's Genito-Urinary Surgery and Venereal Diseases.** By Edward Martin, A.M., M.D., F.A.C.S., John Rhea Barton Professor of Surgery, University of Pennsylvania.... Benjamin A. Thomas, A.M., M.D., F.A.C.S.; Professor of Genito-Urinary Surgery, Polyclinic Hospital and College for Graduates in Medicine; Instructor in Surgery, University of Pennsylvania; and Sterling W. Moorhead, M.D., F.A.C.S., Assistant Surgeon, Howard Hospital, Philadelphia, Pennsylvania. Tenth Edition. 929 pages with 422 engravings and 21 colored plates. Philadelphia and London: J. B. Lippincott Co. 1917. Cloth, $7.00

So radical have been the changes made in bringing out this tenth edition and so many are the additions to the work that it is more like a new treatise than a revision. The best of the old editions, which has stood the test of time, has been preserved and much modern material has been added on such subjects as vaccine and serum therapy, renal functional tests,

the high frequency current, the Wassermann reaction, prostatic hypertrophy, etc.

While we cannot agree with the authors that subdural injections in cerebro-spinal syphilis, ataxia and paresis, are unsafe and without special value, we are not unmidful of the fact that their opinions should carry much weight in the matter and that they are not without good authority for their stand.

The various colored plates not only serve to clarify the text but make the whole work most attractive in appearance. The book should serve as a good textbook for students and also may be appreciated by the practitioner.

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**Diseases of the Skin.** By Milton B. Hartzell, A.M., M.D., LL.D., Philadelphia, Pa., Professor of Dermatology, University of Pennsylvania. Octavo. 753 pages, 242 illustrations, 51 colored plates. Philadelphia: J. B. Lippincott Co. Cloth, $7.00.

This work has been presented in such a manner as to render it a most valuable addition to medical literature. However, it is calculated to be more of a reference book than a text for the student. The chapters on general pathology, physiology and diagnosis are splendid supplements, their value being enhanced by the special consideration of these facts under the individual description of the various skin lesions. The author emphasizes the importance of the pathology and etiology of the skin disorders and devotes much discussion to these points. The chapters on syphilis and pellagra are an exhaustive review of the latest writings and teachings on these subjects. Throughout the treatise the author has placed his personal experience in the foreground, which augments the value of his opinion, especially in the etiology and treatment of diseases. The many splendid photographs incorporated in the issue add to the clearness of the description of the lesions and make the work a necessary and helpful adjunct to the practitioner as well as to the dermatologist.

# SOUTHERN MEDICAL NEWS

## ALABAMA

During the month of February there was an epidemic of smallpox in Jefferson County.

Dr. W. Earle Drennen, Birmingham, has recently received the commission of Major in the M.R.C. and has gone to New York, N. Y., for a special course in brain surgery.

Dr. O. P. Board, Birmingham, has reported for training in the M.R.C., having been commissioned a First Lieutenant.

On February 24 the Jefferson County Medical Society had its dedication services of its service flag at a public meeting held in the ball room of the Tutwiler Hotel. At the same meeting Dr. Guy L. Hunner, Baltimore, addressed the members of the Society on a medical subject.

Drs. W. D. Partlow, U. J. W. Peters and E. P. Hogan attended the meeting of the various state advisory boards that was held in Atlanta February 24 to March 1, under Army officials.

Health Officer Carl A. Grote, of Madison County, announces that the Delineator Company of New York will make a health survey of Huntsville in an endeavor to ascertain the cause of the high infant mortality of that city.

At a recent meeting of the Jefferson County Medical Society it was voted to increase the dues of the Society one dollar per annum and to exempt those in the M.R.C. from all dues.

At its annual session, held during January, the Tuscaloosa County Medical Society elected Dr. Steelsmith all-time Health Officer of the County for a period of three years.

The following compose the Medical Advisory Board for the district composed of Bullock, Barbour, Coffee and Pike counties: Drs. Will Sanders, Chairman; Shelby Sanders, J. M. Watkins, L. B. Boyd, and H. T. McKinnon.

### Deaths

Dr. J. H. Wood, Attalla, aged 60, died at his home on February 22, following a brief illness.

Dr. D. Christian, Springdale, died January 12.

## ARKANSAS

Dr. Brokaw, Detroit, Mich., has been detailed to look after the intensive community work in Ashley County, which has appropriated $3,000 for the campaign against hookworm, typhoid, diarrhea and all diseases borne by flies.

Dr. H. R. McKeen, Bentonville, has gone to Atlanta to assume charge of the duties of the Field Secretary of the Y. M. C. A. in the Army camp at this point.

State Health Officer C. W. Garrison reports that the smallpox epidemic is well under control, but urges vaccination as a valuable prophylaxis.

Dr. Fred Rowell, Pine Bluff, has been elected City Health Officer of that town.

Dr. R. E. Hays has removed from Fulton to Prescott, where he has begun the practice of medicine.

### Deaths

Dr. A. H. Purdue, former State Geologist, died at his home in Nashville, Tenn., during December.

Dr. A. B. Tapscott, Searcy, died suddenly at his home on February 3.

Dr. Roy Love, Dardanelle, aged 35, died at his father's home during January.

Dr. C. E. Pringle, Pocahontas, aged 57, died at his home during January.

Dr. W. A. Thompson, Cabot, died at his home on January 26.

## FLORIDA

Dr. C. T. Young, Assistant State Health Officer, has resigned his position.

Plans have been drawn for the erection of a hundred bed tuberculosis hospital for State prisoners on the State property at Raiford.

Major Johnson, Washington, addressed the members of the Medical Advisory Board of the Northern District of Florida during February.

The Duval County Medical Society held a joint meeting with the physicians from Camp Johnston during February, at which time important matters were discussed.

Acting upon the recommendation of the State Prison Physician, Dr. S. E. Driskell, all surface toilets have been closed, and a method of exterminating the mosquitoes adopted at the State Prison Farm and Hospital at Raiford.

Dr. J. W. Alsobrook, Plant City, has been commissioned in the M.R.C. and has reported for duty.

### Deaths

Dr. T. L. Irwin, Jacksonville, aged 61, died at his home during January.

## GEORGIA

The regular bi-monthly meeting of the Fulton County Medical Society was held on February 20.

Dr. J. W. Owens, Blackshear, and Dr. R. G. Stone, Hawkinsville, have recently been appointed to the medical staff of the Georgia State Sanitarium.

### Deaths

Dr. W. S. Kendrick, Atlanta, aged 75, died at his home on February 22.

Dr. A. P. Taylor, Thomasville, died at his home on February 17, following a prolonged illness.

Dr. W. S. Wilson, Maysville, died suddenly at his home on January 30.

Dr. H. Y. Ferrell, Albany, died from pneumonia during January at the Phoebe Putney Memorial Hospital.

## KENTUCKY

At a recent meeting of the Fayette County Medical Society it was voted to increase the fees, both at home and in the office.

Dr. C. L. Nollaux has been elected City Health Officer at Henderson.

At a recent meeting of the Board of Health, Dr. F. D. Reardon was elected City Health Officer of Bowling Green.

The Hopkins County Medical Society has donated $100 to the Surgical Dressing Units of Madisonville.

Captain J. D. Sory, Sr., is recuperating following a fracture of the left leg sustained while alighting from his automobile.

Dr. E. C. Hartman, Brandenburg, has been appointed on the Meade County Exemption Board to fill the vacancy caused by the death of Dr. Dink.

**Deaths**

Dr. J. W. Violette, Williamstown, died at his home during January.

Dr. J. W. O'Connor, Elizabethton, aged 57, died suddenly at his home on January 31.

Dr. J. W. Johnson, Winchester, died from a stroke of paralysis on February 4.

Dr. W. E. Rodman, Hodgenville, died at his home, from old age, during January.

Dr. Nelson Mays, Richmond, aged 76, died at his home during January, following a prolonged illness.

Dr. J. H. Lampton, Louisville, aged 64, died at his home from tuberculosis February 25.

Dr. J. M. Mason, Hawesville, aged 57, died from tuberculosis on February 16.

## LOUISIANA

Major Jump, of the Council of National Defense, addressed the Orleans Parish Medical Society at a public meeting held at the Grunewald Hotel during January.

## MISSISSIPPI

The Delineator Company of New York will conduct a health survey of Meridian in co-operation with Dr. W. A. Carpenter, City Health Officer.

At a meeting of the Forrest County Medical Society held during February the following officers were elected: President, Dr. L. H. Martin; Vice-President, Dr. J. J. Bethea; Secretary-Treasurer, Dr. May F. Jones.

The newly organized Board of Health of Columbus is composed of the following: Dr. J. D. McCullough, Chairman; Dr. J. W. McClain and Carroll Ackleman.

The District Medical Advisory Board comprising Forrest, George, Greene, Lamar, Pearl River, Perry and Stone counties has been meeting each day at the South Mississippi Infirmary, Hattiesburg, and Dr. L. B. Hudson, Hattiesburg, is Chairman.

Major Jump, U.S.A., delivered an interesting lecture in Meridian during January.

Dr. May F. Jones has assumed her duties as Acting Assistant Surgeon at the office of the U.S.P.H.S., and will have complete charge of school children examination.

## MARYLAND

Dr. F. A. Miller, Hagerstown, has been appointed Deputy State Health Officer of the Salisbury District, succeeding Dr. W. G. Smilie, who goes to Brazil as Exchange Professor in the National University, Sao Paulo.

Dr. J. H. Crum, Detroit, delivered a lecture before the Baltimore County Medical Association on February 16.

## MISSOURI

A Volunteer Medical Service Medical Corps has been organized by the Council of National Defense for the purpose of caring for the health of the families and dependents of enlisted men.

Dr. Daniel Morton, St. Joseph, has been appointed Chairman of the Committee on Physical Reserve.

Dr. B. L. Bischoff, Belleville, has been promoted to a Captaincy in the M.R.C.

The Boone County Medical Society held its regular meeting on January 31 in Columbia.

Dr. G. B. Mangold, Director of the Missouri School of Social Economy at St. Louis, has begun a series of lectures in the Home Service Course.

Dr. Eugene Carbaugh, Health Director, has appointed the following physicians for the Emergency and General Hospital, Kansas City: General, Drs. W. C. Klein, A. H. Adamson and A. Weinberg; Emergency, Drs. C. R. Johnson, J. W. Hallberg, W. E. Montgomery, E. L. Ginsberg.

An epidemic of smallpox has existed in Kansas City for some weeks.

**Deaths**

Dr. Henry Rohlfing, St. Louis, aged 56, died at his home on February 19.

Dr. Willis Hamilton, Richmond, aged 87, died at a hospital in St. Joseph, following fracture of his right hip on February 2.

Dr. J. R. Wood, Laddonia, aged 25, died at Fort Sam Houston, Tex., following an attack of pneumonia, February 5.

Dr. Alfred Townsend, Kenoma, died at his home on February 24, following a prolonged illness.

## NORTH CAROLINA

The health authorities have successfully checked the cerebro-spinal meningitis epidemic that recently appeared in Charlotte.

Dr. B. A. Doggett has resigned as Superintendent of the James Walker Memorial Hospital and has accepted a position in the Mayo Clinics.

The following physicians compose the Medical Advisory Board for the Charlotte district: Drs. A. J. Crowell, Chairman; W. O. Nesbit, A. M. Whisnant, C. E. Walker, B. J. Witherspoon and P. C. Hull.

**Deaths**

Dr. E. A. Hennessee, Glen Alpine, was murdered on January 31.

Dr. J. H. Nicholson, Richlands, died at his home January 23.

Dr. G. G. McManaway, Charlotte, died at his home after a prolonged illness on February 15.

Dr. R. Lee Payne, Durham, aged 62, died at the Malbourne Hotel, Durham, February 13.

Dr. Frank Clark, Middleton, died following a serious illness on February 6.

## OKLAHOMA

On February 7 a special meeting of medical members of the Local Exemption Boards of the State was held in Tulsa.

City Health Officer of Henryetta announces that an epidemic of smallpox exists in that city and vicinity.

Drs. J. W. Baker and A. L. McInnis, Enid, have been appointed County and Assistant County Physicians of Garfield County.

Dr. J. C. Johnston has succeeded Dr. W. C. Graves, resigned, as a member of the Exemption Board for Pittsburg County.

On account of the resignation and removal, respectively, of Dr. J. G. Rafter and Dr. John Reynolds, the positions of City Superintendent and City Physician have been assigned to Dr. H. T. Ballantine and Dr. H. L. Scott, Muskogee.

## SOUTH CAROLINA

Dr. L. B. Salters, Blenheim, has removed to Florence, where he will begin the practice of medicine.

The Medical Advisory Board for the First District of South Carolina has been organized and the following compose the Board: Dr. L. O. Mauldin, Chairman; Dr. J. L. Anderson and Dr. G. W. Tyler, all of Greenville; Dr. C. A. Mobley, Rock Hill; Dr. Frank Ashmore, Anderson.

Dr. C. E. Lowe, Spartanburg, is able to be at his duties following an attack of pneumonia.

Dr. F. A. Coward, Columbia, was elected Vice-President of the Tri-State Medical Association at its recent meeting held in Charleston.

Dr. R. S. Cathcart, Charleston, was elected President of the Tri-State Medical Association at its annual session just adjourned at Charleston.

The Medical College of the State of South Carolina held its annual ball on February 9.

**Deaths**

Dr. A. Rauch, Greenville, aged 77, died at his home on February 3.

Dr. R. J. Patterson, Bennettsville, aged 82, died at his home on February 25.

## TENNESSEE

The service flag of the Meharry Medical College was dedicated on February 15.

The Medical Advisory Board for Sullivan County is composed of: Dr. W. B. St. John, Chairman; Drs. N. T. Dulaney, J. S. Bachman, Mat B. St. John and H. G. Cuningham.

The personnel of the Chattanooga Medical Unit has been completed and the services of the Unit has been offered the Government. The following physicians and surgeons are included: Drs. H. L. Fancher,

(Continued on page 28)

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(Continued from page 262)

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At its February meeting, the Knox County Medical Society elected the following officers for 1918: President, Dr. Walter Luttrell; Vice-President, Dr. M. C. Wright; Secretary-Treasurer, Dr. W. N. Lynn.

The Knox County Medical Society gave a "Hoover dinner" to its members on January 8.

Dr. J. C. Overall has removed from Lascassas to Murfreesboro.

Dr. E. M. Holmes, Murfreesboro, has assumed his duties as Assistant Superintendent of the Central Hospital for the Insane at Nashville.

The following officers have been elected by the Giles County Medical Society for the ensuing year: President, Dr. J. A. LaRue, Pulaski; Vice-President, Dr. Denman, Lynnville; Secretary, Dr. C. A. Abernathy, Pulaski; Treasurer, Dr. C. C. Grimes, Pulaski.

## TEXAS

Dr. W. S. Carter, Dean of the State Medical College, has gone to California for the purpose of studying the workings of the medical schools of that State and when en route stopped at Chicago to attend the convention of the Association of American Medical Colleges.

Dr. W. B. Reeves, who has been practicing in Oklahome for the past several years, has moved to Greenville.

Dr. S. E. Thompson, Kerrville, formerly Medical Director of the State Tuberculosis Sanatorium at Carlsbad, has purchased the Mountain Park Sanatorium and changed its name to the Thompson Sanatorium.

Dr. J. S. Wilkins, Paducah, has removed to Hot Springs, Ark., where he will be associated with Dr. B. E. Breedlove.

Dr. Powers has removed from Ft. Stockton to Rankin.

Dr. P. M. Payne has removed from Dallas to Pittsburg, where he will begin the practice of medicine.

### Deaths

Dr. N. Ketchum, aged 89, died at his home on January 23.

Dr. C. C. Hawkins, Waco, aged 62, died at his home on January 22.

Dr. D. B. Morrow, Dallas, aged 79, died at his home on February 12.

## VIRGINIA

Dr. C. R. Hughes has recently been commissioned Assistant Surgeon in the Navy. He has resigned from the staff of the Virginia Hospital at Richmond.

Dr. J. W. Reed, Ocean View, has been appointed Health Officer of Norfolk County by the Norfolk County Board of Health.

### Deaths

Dr. W. C. Day, Danville, aged 77, died from pneumonia at his home on January 26.

Dr. F. A. Rice, Dante, died at his home on January 25.

Dr. R. H. Alfred, Dayton, aged 83, died at his home, following a brief illness, on February 25.

Dr. F. M. Reade, Richmond, aged 55, died at his home on February 26, following a protracted illness.

Dr. J. G. Riddick, Norfolk, aged 72, died at his home on February 15.

## WEST VIRGINIA

Dr. Karl Steinbach, Parkersburg, has returned from Cincinnati, where he has been under treatment of an eye specialist, and is able to be at his post of duty again.

The Little Kanawha and Ohio Valley Medical Society held its regular meeting on February 7.

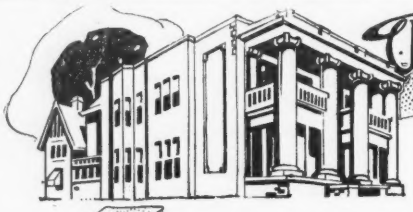
The Ohio County Medical Society held a patriotic meeting on February 16.

Dr. G. R. Ogden, Grafton, aged 53, died at a hospital in Clarksburg on February 15.

Dr. Charles M. Frissell, Wheeling, aged 59, died at his home on February 12.

Dr. Lloyd McKinney, Martinsburg, aged 50, died at his home from typhoid fever on February 20.

Dr. W. S. Keever, Parkersburg, died on February 3.

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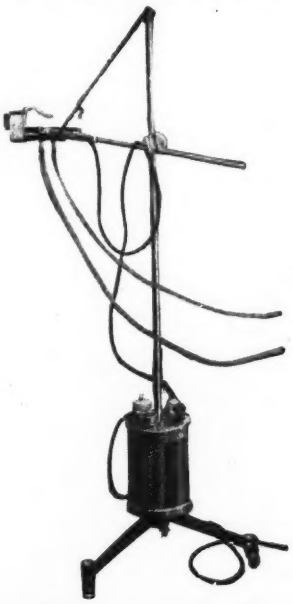

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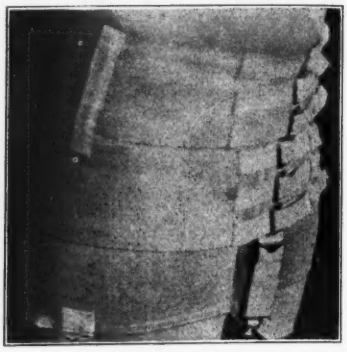

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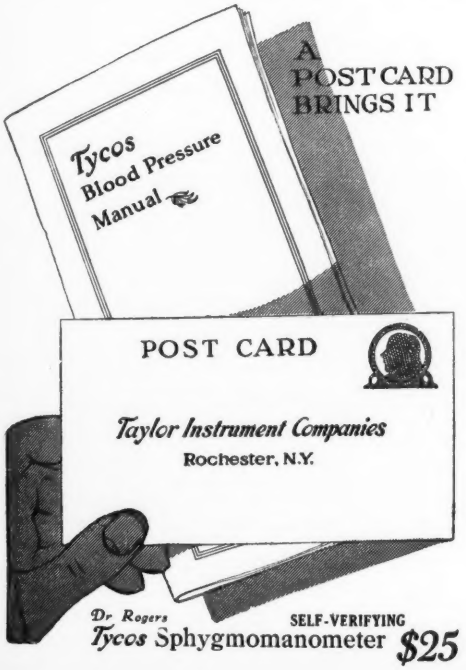


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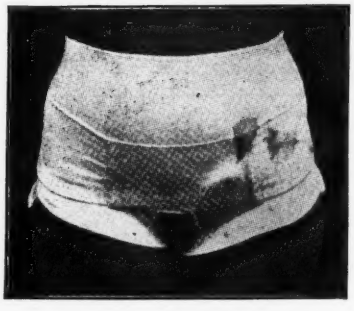

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*Bloom, New Orleans Medical and Surg. Journal, Vol. 70, No. 3, Sept. 1917, page 282.

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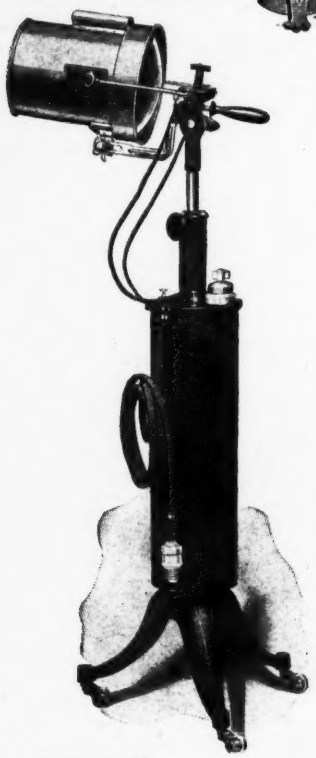

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